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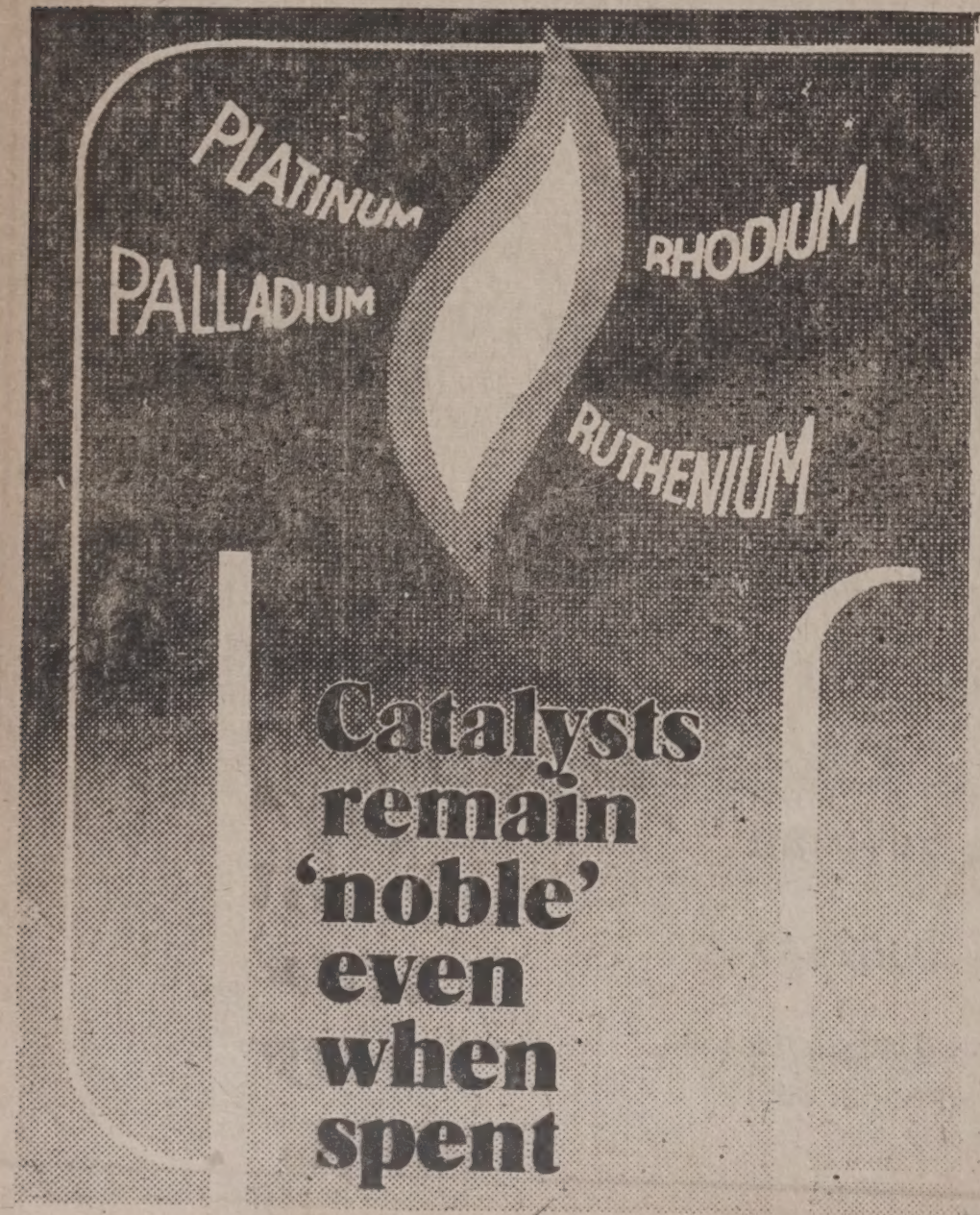

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CHEMICAL WEEKLY

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HERALDING THE 21st CENTURY - 33 (a)

A Seer's Catalogue

The American Futurologist Journal *OMNI* continues its soothsaying interviews with other leaders of thought.

David Byrne, Lead Singer. Talking Heads.: The line between so-called erious and popular art will blur even more than it already has because poe-le's attitudes are changing. More and more people will turn to the arts for he kind of support and inspiration religion used to offer them. Eventually ome new kind of formula — an equivalent of religion — will emerge and ncompass art, physics, psychiatry, and genetic engineering without deny-ng evolution or any of the possible cosmologies.

People have exaggerated greatly the effects new technology has on the rts and on the number of people who will make art in the future. I realize hat computers are in their infancy, but they're pretty pathetic, and I'm not he only one who's said that computers won't take into account nuances or vagueness or presumptions or anything like intuition.

I don't think computers will have any important effect on the arts in 2007. They may help creative people with their bookkeeping, but they won't help in the creative process. The video revolution, however, will have some real impact on the arts in the next 20 years. It already has. Because people's attention spans are getting shorter, more fiction and drama will be done on television, a perfect medium for them. But I don't think anything will be wiped out, books will always be there, everything will find its place. Outlets for art, in the- marketplace and on television, will multiply and spread. The networks will be freed from the need to try to please everybody.

I don't think that global video and satellites will produce any global concept of community in the next 20 years, but people will have a greater awareness of their immediate communities. We will begin to notice the great artistic work going on outside of the major cities — outside of New York, Los Angeles, Paris and London.

Richard Selzer, Author and Professor of Surgery, Yale Medical School: Many of the diseases that plague us today — cancer arteriosclerosis, arthritis, diabetes and many infectious diseases — will fade from the scene in the next 20 years because effective ways to prevent or treat them will be found. When I look at the past from my perspective as a surgeon, I see how one condition after another has faded from the surgical purview. Boredom will be the major medical problem of the future B.O.R.E. D.O.M! As leisure time increases, as life gets more and more mechanized people become bored — and that creates a dangerous situation. Our intensive — care units are crammed already with people suffering from the complications of boredom. When we are bored we drive our cars and motorcycles too fast, we take drugs, drink or eat to excess. We grow careless. We injure ourselves.

The most important development in research in 20 years probably will be the development of antiviral drugs and vaccines that will wipe out many communicable diseases. Genetic manipulation will help us dispose of the congenital defects that have plagued society for so long. As we learn how to manipulate genes, I hope that we will not end up creating a superrace in 2010. It is a real possibility. I hope we attempt to preserve the individual nature of each human being and try not to create a race of monster athletes and geniuses, which I think will be a great temptation. We already have a sperm bank for Nobel prize-winners. The natural curiosity of man impels us further and further. We can now grow embryos for 36 hours in a dish. Well if this is the case, why can't we just grow a whole baby in a platter, moving the expanding embryo to a larger and larger dish, and finally serve a full-grown baby in a casserole to a man or woman? There is a certain absurdity to it, but why not? If we can keep the nutrients flowing, keep it in a bath of perfect salinity and temperature and feed it in certain ways, it certainly doesn't break my brain cells to conceive of it.

Our research in combating AIDS will teach us how to deal more effectively with problems of the immune system, and out of this will come, among other things, a dramatic increase in the success and number of transplant operations. In 2007 there are going to be all kinds of transplants: heart transplant, lung transplant, brain-cell transplants. One great advance will be the discovery of some mechanism by which nerve tissue can be regenerated so that the legions of paraplegics and quadriplegics can be rehabilitated. Also, there will be an intense effort to develop ways of effectively treating radiation disease, radiation syndrome. The presence of nuclear weapons and an increased dependence on nuclear power for fuel will be a constant threat. You cannot solve the problems by crating a vaccine, which is a tough enough task. But in 20 years we will work out ways to protect our bone marrow and skin from radiation.

The increased use of machines to diagnose people will make a tremendous difference in the doctor-patient relationship. The doctor will simply plug, in a lot of equipment, draw blood, urine, sweat, semen, saliva, stool, analyze it, and draw inferences from that. But that's not my idea of diagnosis. I'm glad I spent most of my career in medicine at the patient's bedside in an intimate kind of relationship, while it still required the diagnostic embrace.

But this relationship is dying. I see a distancing between doctor and patient. We certainly have failed the American public. The image of the doctor gives off an ill odor in this country. Doctors are seen as people more interested in having and doing than they are in feeling and perceiving. When I first began my career as a doctor, I thought that we had reached such a high plateau that we would go on with only minimal advances for an indefinite

period of time. But in the last 20 years the medical field has exploded. Technology — my God! Think of it, you can grow human skin in the laboratory and use it to treat burns. So reality has outstripped my wildest dreams in the creation of new treatments and technologies. But medicine has slipped — we have lost touch with its original impetus, the concern for each individual patient.

Robert Heilbroner, Norman Thomas Professor of Economics, New School For Social Research: There is an alarming possibility that our economy is moving in the direction of what some people call a two-tier society — a large population of people with middle-class or higher incomes and values, with a considerable bulge at the top and a large number of people who have been economically and culturally uncoupled from the main society. What's most alarming is that the ladder that has connected the bottom to the top is now missing some important rungs. There were certain industries, like the steel and auto industries, that provided more or less continuous ladders of jobs from the bottom to the top. You could enter as an unskilled person, acquire new skills, and move up the ladder into secure, unionised, betterpaying jobs. But now these industries have been seriously imperiled, and their place as employers has been replaced by what I call the McDonald's employers. More people work for McDonald's than work for U.S. Steel, but McDonald's has no ladders. The problem is serious.

A great many economists, feel uneasy about the fact that 70% of the economy does what is called service work and only 30% does what is called goods-related work. New technology keeps entering the economy and disrupting employment. When you look back at how the American economy developed, you see a migration off the farm into the factory and out of the factory into the office. The main push has come from technology. There has been relatively little new machinery to push people out of the office, but that's changing now. If the computer creates jobs in the office, the service sector will increase and there will be no squeezing of employment. But if technology bumps service people out of work. I don't know where they are going to go.

In the next 20 years the government will have to take active steps in providing work and income for the bottom one third of the population. The government grudgingly provides some sort of income, but it doesn't provide work. And work is essential for people's self-esteem and also for the building of many kinds of infrastructures that are needed in the country.

It is clear which countries are emerging as economic powers. It is entirely possible that Japan is going to be the England of the future — I mean the 1850s England. Japan may be the organizer for a 'Pacific Rim' economy — as England was for Europe a century ago. Japan may combine its leadership and technology with the inexpensive manpower and the intelligence of the Chinese, the Malayasians, the Taiwanese, the Indians, the Koreans. It is quite possible that there will be a new world economic "empire" out there, which will severely challenge the formerly undisputed hegemony of the West.

Andrew Greeley, Author, Priest, and Professor of Sociology at the University of Arizona in Tucson: Women will remake religion — both its institutions and theology. This will improve the church because it has been deprived of the emotional concern and the tenderness that women, performing at their best, bring to any environment.

We'll also see increased emphasis on the non-rational — the emotional, mystical, and poetic aspects of religion — in 20 years. We will recognise the importance of symbol and narrative. Religion is metaphor and narrative long before it becomes creed and theology. Religion is poetry before it is prose, and I think a lot of religious thought is going to develop in those directions. The emphasis on teaching religion through story is going to increase. This will be part of the feminization factor. I suspect most of us who grew up with a religious heritage pretty much absorbed that heritage through stories — the stories our parents told us, particularly our — the Christmas story, the Passover story. Stories are an enormously tant means of passing on religion — much more important means sing on religion —much more important than theology. Format story novelists, screenplay writers, parents, and teachers will develop th ytelling talents in order to pass on religion.

The so-called conflict between science and religion will continue and vanish 20 years from now. Oddly enough, I think the theoretica icists and some biochemists are more concerned about questions o soul, and creation than are most mainline theologians, who are utte occupied with politics. They aren't paying attention to what science is about the world, to the questions about how the world began or ab relationship between biochemistry and thought.

Most people have a strong feeling that science does not tell yo life means. That feeling is very strong now, and it will only grow st In 20 years no one is going to claim humankind is drifting away fro gion — that we don't need religion. Of course, there will be people religious sensibilities are not very strong.

Within my own tradition, the power of the Pope definitely will s Today we are experiencing the last gasp of a dying order, and in 20 most of it will be gone. There will be a new leadership more interes listening to what the people say than sermon.

David Schramm, Chairman of Department of Astronomy and A physics, University of Chicago: The next 20 years will be exciting in ics and astronomy. Everything almost fits. The Big Bang looks grea we've got good ideas about the unification of the weak and electroma theories. But there are nagging questions. How do we really bring strong interaction in gravity? How do we really unify all the forces, n a few of them? What is the nature of space-time itself? What is the of the real vacuum in space? Why do we have three dimensions in as opposed to some other number of dimensions in time? There is als problem that the bulk of the matter of the universe appears to be in form that we cannot identify. It must be there but we don't know w is. What is it that we call the dark matter?

In astronomy we'll develop more systematic surveys in the sky with b resolution and greater intensity. In 20 years, we will have the next g ration of instalments, a very large space telescope — one much larger any telescope that currently exists — and an array of X-ray telescopes might be able to resolve objects in space to very small dimensions. We would be able to figure out what is going on inside a quarter or what's g on around the surface of a neutron star.

We are all searching for what we call the theory of everything TO we found TOE we would know how all the forces interact, how the verse began. We would test the Big Bang farther back in time than w ever been able to test it.

The theory of everything would probably show that space itself is m up of some hidden dimension, some other aspects. The forces that we at today are really geometric projections into our three-dimensional sp of some higher-dimensional space, like ten-dimensional space. This c change the whole philosophical basis of space, time, and the purpose of existence. It would certainly change our perspective. Twenty years a was an undergraduate. And never in my wildest dreams did I think that would even come close to the kinds of developments we are deal with now.

-- T.P.S. RAJ

(Condensed from the interview conducted by Marion Long with difer Futurists and reproduced under the title "The Seers' Catalog" in OMNI P lications International Ltd., Jan. 1987.)

CHEMARENA

S.L. VENKITESWARAN

LPG to Aromatics

The single-step process of getting aromatics from propane r other LPG feedstock is now a reality and British Petrolum is the pioneer in this with a demonstration plant in UK. his new Cyclar process uses a proprietory zeolite catalyst f BP and a dehydrogenation catalyst for the propane or utane to corresponding olefines. After dehydrogenation there s a dimerisation before cyclisation and the three steps are aid to be in one step. There is need for a continuous regenration of catalyst and for this UOP of USA have the best nowhow which is incorporated in the process cycle. The electivity to aromatics is said to be high at 65% while hydroen is a valuable coproduct to the extent of 6%. The demontration plant is of 100 tonnes a day of benzene, toluene, ylene mix. The catalyst is also said to be further improved or the final version.

The conversion of C3/C4 paraffins to aromatics is certainly ttractive even if ultimate yield is only 60% of the feed --more o in the days when naphtha is getting scarcer. The claims re that cyclar process will be competitive with reformerased production. The capital costs are not indicated at resent. Pyrolysis fractions of naphtha cracking is of course a low cost source of benzene but pricing is the subject of relative sales value of the olefines.

BP's Cyclar process is a real brakthrough to aromatics and dependence on naphtha for reforming or cracking is reduced. There is much expectation from this latest of BP's technologies. Only recently they announced another breakthrough of propane directly to acrylonitrile without going through a separate dehydrogenation plant. We are indeed well into an era of a wide range of petrochemicals without resort to naphtha -- which could become increasingly scarce and costlier in the next ten years. India has also abundance of natural gas but rather low content of C3/C4 but there is increasing availability of C3/C4 olefines from catcracking. Methanol derived from methane is also a way to aromatics -- as per the revolutionary MTG process also based on zeolite catalysts -- but costs may not be competitive. Even ethyl alcohol can be converted into aromatics but again economics are unfavourable.

India should have a detailed look at these emerging technologies for olefines by dehydrogenation and now aromatics from C3/C4 paraffins.

Carbon Monoxide to Butanol

An improved process for getting butanol directly from carbon monoxide is reported by researchers of Michigan Biotech Research Institute. This is a strange fermentation process for which a new microorganism -- Butyrolacterium methyltrophium -- isolated by them which can feed on carbon monoxide or synthesis gas itself is used. Even sulphur containing impurities in the syngas do not affect the process. But the present levels are only 0.5 gm/litre -- an extremely low level for any commercial value.

Perhaps this has to be raised manyfold. The bacteria can also metabolise hydrogen to reduce any butyric acid.

Another Immuno-suppressant

The discovery of cyclosporin and its ability to suppress rejection of transplanted organs has proved a boon to the thousands of kidney and other transplant operations. Sandoz have a market of $450 million for their Sandimmun. Now a new product termed FK506 has been discovered by researchers at the University of Pittsburg, sponsored by Fujisawa of Japan and Fisons of U.K. There is said to be a race for commercial developments of FK506 which is also a macrolide antibiotic about hundred times more active than cyclosporin. There is said to be much prospects for using FK 506 for diseases like rheumatoid arthritis, psoriasis, sclerosis and other diseases where the bodies own antibodies are affected.

There is a lot of tests and trials over years before the potential can be proved but approval as an IND -- Investigational New Drug -- for organ transplant is said to be clear.

Acrylonitrile From Propane

British Petroleum have already completed process work on the direct production of acrylonitrile from propane instead of going via propylene. They claim to have a proprietory catalyst which enables dehydrogenation of propane and ammoxidation of the propylene in one step simultaneously. The process is to be tried out in a pilot plant set up at their Cleveland, Ohio plant and is expected to be in commercial scale before mid 90's. The process is said to be fully viable in view of the high price differentials between propane and propylene and the difficulties for confirmed long-term supplies of propylene without tie up with a large naphtha cracker plex. Presently refinery propylene is also available from and can be used but for the other components.

Propane dehydrogenation is a reality now but if t avoided in a separate plant, economies are possible if y of the acrylonitrile are not affected. The hydrogen copr may cause difficulties which must have been tackled. results of the test reactor and prospects of propane based duction will be looked forward to.

OPEC's Agreement

The Organisation of Petroleum Exporting Countries (OPEC) have been able to work out an agreement on production and quotas for the individual members for January/June 1990 and to get all members to sign the agreement. The level is to be 22 million barrels per day as against the present 20.5 million barrels per day which in any case has been exceeded by some members. The price will be $18 per barrel and members are expected not to lower this surreptitiously. Saudi Arabia is the largest with 24.46% share but there is the usual bickerings between Kuwait and UAE and now between Iran and Iraq. But it is expected that the new agreement on quotas will hold much better because the ma is better with US being a heavy importer. The Gulf c tries are in a happy position of holding the bulk of w reserves — 85% and so the capability to dictate terms in coming years.

India's position is not a happy one with ever increa demands and no significant increase in Indian product Apart from Gandhar, there is only the Kaveri basin but potential, let alone production, is still uncertain and not m prospects for any jump in the 8th Plan.

Catalysts for alpha olefines

A new class of catalysts for alpha olefines from ethylene have been developed by Union Carbide. "The heart of the catalyst system is a novel ligand promoter having phosphones and sulfonate moieties capable of bidentate coordination to transition metals." The objective was a synthetic route to the ligands possessing the phosphones and sulfonate moieties, ortho substituted phosphonic sulfonate moieties and ligands in which phosphine and sulfonates are connected thro short alkyl chains. Special reactions were developed thro lithium phosphides and sodium-2 chloroethane sulfonate. catalysts were prepared with nickel salts and a variety of compounds with good catalytic activity for ethylene poly ers (alpha olefines). The process developments for comm cial use of these promising catalysts are expected.

PARAXYLENE, BENZENE

BICP for low price levels

The Bureau of Industrial Costs and Prices (BICP) has recommended that the prices of paraxylene and benzene be maintained at low levels, preferably close to the normative prices.

The BICP report on aromatics, submitted to the government in December, 1988, and available now, says that if naphtha is made available at international prices plus a nominal duty of Rs. 25 per cent and long-term supply price of paraxylene prevail at $ 336-411 per tonne against $ 836 per tonne prevailing in 1988, indigenous manufacturers of paraxylene require protection to the tune of 72 per cent at crude price of $ 15 per barrel and of 56 per cent at $ 18 per barrel.

Against this, in December 1988 paraxylene was subjected to a customs duty of 120 per cent (basic 75 per cent, auxiliary 45 per cent and countervailing nil if imported for manufacture of DMT). At a CIF price of $ 836 per tonne, imported paraxylene costs Rs. 27,588 per tonne in the domestic market ($ 1 = Rs. 15 and customs duty of 120 per cent).

At this level of international prices, the protection available to domestic industry is very high, the report says. In December 1988 benzene was subject to an import levy of Rs. 475 per kl (countervailing) basic duty of customs and auxiliary duties of customs being nil. At a CIF price of $ 418 per tonne, landed cost of imported benzene was Rs. 6,829.25 per tonne, including a customs duty of Rs. 622.25 per tonne.

The report says that domestic prices of naphtha for a non-fertiliser application are kept high under the regime of administered prices. If naphtha is made available at international prices plus a nominal duty of 25 per cent ad valorem, indigenous manufacturers will be in a position to supply benzene at Rs. 6,039-6,822 per tonne.

At an international price of crude at $ 15 a barrel, domestic benzene manufacturers will require protection to the extent of 53 per cent ad valorem and at $ 18 a barrel, 42 per cent ad valorem, according to the report.

The report says that in the immediate future, the duty levels would need to be further scaled down as the current international prices are way above the anticipated stabilised price level. The current (December 1988) CIF prices of benzene and paraxylene are $ 418 per tonne and $ 836 per tonne. Domestic industry needs no protection to realise normative prices. However considering that foreign exchange is scarce and has a premium of 25 per cent, nominal duty level of 25 per cent may be imposed on both benzene and paraxylene.

The report has estimated the long range marginal cost (LRMC) for paraxylene of unit 124 at Rs. 9515 per tonne. This price provides, on an average over the life, around 24 per cent pretax profit (12 per cent post-tax) on initial equity (assessed as 33 per cent to total investment).

The spurt in international prices of aromatics and other petrochemicals coupled with devaluation of currency has reduced the gap between dom and international prices. The s imbalance in demand and supp aromatics appears to have led to th tional price movement.

While price of naphtha in Oc 1988, declined as compare December, 1987, though margi (minus seven per cent), the pri aromatics (BTX), derived from nap escalated to 52 per cent in case of zene and (plus) 158 per cent in ca paraxylene.

HUGE DEPOSITS OF RARE EARTH MINERALS FOUND TAMIL NADU

Huge deposits of rare earth min have been located at Nazreth Tuticorin beach of Tamilnadu, acc ing to Mr. N.R. Nayar, General M ager of the Indian Rare Earths (I Deposits of rare earth materials also been found at Vimilipatna beac Andhra Pradesh.

Mr. Nayar said in an interview the Department of Atomic Energy working out the economic feasibili the deposits found both at Nazreth Vimilipatna. He said the radiation o IRE plant was "minimum and not ardous to health". The plant autho had adopted various control measur contain the radiation which he clai was "within the tolerance limi human beings".

O.P. KHARBANDA

FRANKLY SPEAKING

**Dr. O.P. KHARBANDA, Cost & Management Consultant,
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R & D - Here and there

I am convinced that future of chemical industry, as indeed of any industry, lies in R & D. Further, perhaps, one can never have too much of R & D — reason enough for me to revert to this theme. Basically, R & D is an in-company activity, though Japan has excelled in supplementing this with industry-wide R & D — and with considerable success. The lesson in now being learnt elsewhere, too, for example in Europe. A formal organisation, IRDAC (Industrial R & D Advisory Committee of the European Commission) with over 400 research managers, has been serving the interest of 'consumers', big and small, in Europe. With its own Joint Research Centre and laboratories in Belgium, Italy and the Netherlands, IRDAC has started marketing its services to industry. And who do you think was its first customer? Japan! (David Fishlock: 'Why R & D muscle must be toned up', Financial Times, June 23, 1989 p. 12). Some of the existing European R & D programmes (e.g., ESPRIT in electronics and BRITE, basic research in industrial technologies) are aimed at big companies. By contrast, IRDAC, is directed mainly to help smaller companies. Its objectives, briefly are:

* Have a strong multi-disciplinary network in Europe
* Coordinate national R & D efforts in order to avoid duplication
* Harmonise its standards, regulations & product approval systems
* Provide flexible training system for specialists in demand
* Use specialists even after their normal retirement.

European companies must emulate their Japanese counterparts in using the facilities at European laboratories and universities. The current focus on 'bigger is better' needs to be shifted, and far more attention needs to be paid to international collaboration. It not only prevents 'reinventing wheel', but happens to be the most economic and quick so tion to a problem. Typical of IRDAC's current projects a $0.5 billion programme of an ambitious Joint Europe Sub-Micron Silicon Initiative (JESSI). It is aimed at pro ding the European semiconductor industry with sub-micro scale manufacturing technology for chips, in a form whi individual companies can adapt to their own requiremen

Japan really enjoys best of both the worlds — East a West. She always seems to be on a shopping 'spree' for tec nologies from all over the world — and then she adapts a improves upon it, through both in-house R & D as well as i dustry-wide cooperative R & D. As an example in case electricity industry, Japan's biggest company, the Tokyo Ele tric Power Company (TEPCO), while continuing to support large cooperative R & D programme with other electricit companies, is at the same time expanding its own R & D act vity. (David Fishlock: 'A new generation of Japanese R & comes of age', Financial Times, October 11, 1989 p. 17). Wh two programmes, and that too at a time when the UK elec tricity industry has been reducing its expenditure on R & D For some years, TEPCO had been failing to attract enoug top talent. A survey as to what kind of company, new grad uates wanted to work for, revealed that they preferred com panies developing technology in-house. As part of thei expansion, TEPCO will have a new R & D centre in the early 1990's, initially for about 500 scientists and later upto 1000 At present the in-house facility consists of an engineering laboratory in Tokyo employing about 120, but bulk of thei R & D work is being carried out under contract in the labor atories of companies such as Hitachi and Mitsubishi. TEPCO is also the biggest contributor to the R & D programme of CRIEP (Central Research Institute of the Electric Power Industry) in Tokyo, a cooperative research centre, with a staff of about 800, funded by all nine Japanese electricity companies. Its aims: To cut the cost of electricity; improve the quality of its supply and to create new services for the industry. To achieve these aims, intensive R & D is a must.

Dr. Kharbanda, a Fellow of the tution of Chemical Engineers, is a visiting professor and an author of epute. His recent title: SAFETY IN CHEMICAL INDUSTRY, (Heinemann, 1988). Forthcoming titles: (All with Mr. E.A. Stallworthy) WASTE MANAGEMENT — TOWARDS A SUSTAINABLE SOCIETY (Gower, 1989) & PROJECT TEAMS — THE HUMAN ELEMENT (NTL. COMPUTING CENTRE, 1990). Available from Vivek Enterprises, 5, S.K. Barodawalla Marg, Bombay 400 026.

RPG group to go ahead with Manali petrochem project

e RP Goenka group is serious implementing the Rs. 1,000 crore er cent export-oriented petrochem- project at Manali in Madras in col- ation with Linde AG of West nany.

sserting this in Madras on January 990, Mr. Harshvardhan Goenka, aging Director of Ceat Tyres of a Ltd. and his brother Mr. Sanjiv nka, Chairman of Spencers Ltd., the detailed project report (DPR) ow getting ready and the construc- work on the petrochem project will t by June-July.

There is no delay in implementing the ject and it was also announced earlier t it will be finalised by early 1990. th the State Government and the ntre and extending "positive support" y told newsmen in Madras recently.

As it is a major export project, an ensive study is underway on market- feasibility. The funding pattern is o being worked out. All the neces- y clearances except the one relating foreign exchange have been obtained.

Mr. H.V. Goenka said the public ctor Madras Refineries Ltd., had off- ed to participate in the venture, but no cision had been taken. Replying to a uery he said there is no proposal from e Tamil Nadu Government to join the roject. Mr. Sanjiv Goenka did not xpect the project cost to go up. Based n naphtha, the unit will have a capac- y to manufacture 4.5 lakh tonnes of thylene and two lakh tonnes of poly- ropylene.

They said the RPG group has taken p the Linde project independent of the Haldia Petrochem Project in Calcutta. The current competition among major business groups to participate in the downstreams project's of Haldia petro- chem complex has nothing to do with the execution of the Linde venture, they stressed.

Referring to another group company in Madras which Spencers Ltd., acquired last year, Mr. H.V. Goenka said its working is being studied to reactivate its operations, "We want to make it a consumer product giant exploiting its strong brand image", he noted.

Spencers will remain mainly a marketing company concentrating its operations in consumer durables. The sales turnover of the pharmaceutical division will go up from Rs. 1 crore now to Rs. 5 crores.

While explaining the features of forthcoming rights convertible debenture and non-convertible debenture issues of Ceat Tyres, Mr. H.V. Goenka said the company hopes to boost its export earnings substantially from the present Rs. 20 crores. Instead of looking at conventional markets like the USSR, Afghanistan and Pakistan, the company will be largely tapping US and West German markets taking advantage of the benefits available for truck tyre exports.

He sought to allay fears that there is a glut in the tyre market. As such there is no demand-supply imbalance. The demand is expected to maintain the current growth rate of seven to eight per cent.

It is only the small companies which are finding it difficult to meet the competition.

He also denied the charge that tyre prices have shot up heavily. They are going up only 5 to 5.5 per cent every year which is not much considering the steep increase in the cost of rubber and rubber chemicals.

New thrust on science and technology projects soon

The Minister of State for Science and Technology, Prof. M.G.K. Menon, said recently that new thrust would be given to better co-ordination and integration of various science and technology projects to effectively implement them to benefit maximum people. Addressing a new conference he said poverty alleviation and employment generation would be given adequate emphasis.

He said the Government would take steps for the proper management and utilisation of the existing infrastructure. The existing projects would be reviewed with a focus on ascertaining the achievable points and the missing links, he said. There was nothing wrong in the present science policy and there was no question of any sudden change, he said.

Asked about the reported statement of the Minister of State for Environment and Forests, Mrs. Maneka Gandhi, against the nuclear power generation programme, Prof. Menon said the Government had not made any statement on the subject.

On the Soviet offer for nuclear power plants, he said no detailed project reports had been signed so far. The ongoing projects or India's stand on the nuclear proliferation treaty would not be violated in any case. Asked whether there was any proposal to scrap the scientific advisory council, he said he was yet to look into that question. He said a proper linkage between research laboratories and the industry was essential. The in-house research and development in the industry should be encouraged.

Asked about the review committee's report on the Council of Scientific and Industrial Research (CSIR), Prof. Menon said there was no question of reviewing the report. Practical problems could be looked into individually. Replying to a question on the re-entry of American multinational IBM, he said there was no application from them for this purpose. A wide range of questions would have to be examined in taking decisions on such issues.

Prof. Menon said there was no move for centralisation of various scientific departments or laboratories. The success depended on the way their roles were defined and various teams brought together for appropriate subjects.

TWO MINERAL UNITS TO BE SET UP IN THE SOUTH

Two mineral units would be set up, one each at Kuthiraimozhi i Nadu and Beeminipatnam in Pradesh, at a cost of Rs. 25 cror Mr. R.K. Garg, Chairman and ing Director, Indian Rare Eart said in Nagarcoil recently. Spea a function here, he said work o projects would begin during the financial year. The environme forest clearances are awaited.

LARSEN APPOINTED CHA MAN EMERITUS OF L & T

Mr. Holck Larsen, who hol than one per cent stake in Lars Toubro Ltd. has been appointed man emeritus of the company Larsen, who is one of the found the company was unanim appointed to this new post, at a meeting held on December 30, Mr. Larsen's new appointment is ting tribute to his outstanding con tion in setting up one of In engineering conglomerate, along Mr. Soren K. Toubro.

CORRIGENDUM

In the write up titled 'Ram Bros. Get-together' published Chemicai Weekly dated 2nd Ja ary, page 42, the name of the Ex utive Vice President was wron spelt. It should correctly read **Mr. S.G. Makim,** Executive V President of Indian Organic Che icals Ltd. The error is regretted.

-- Edi

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Top scientists to attend first superconductivity seminar in India

A galaxy of top scientists from the global superconductivity research community are expected to attend the first ever International Conference on Superconductivity being held in the country at Bangalore between January 10 and 14. Apart from invited talks by well known researchers in the field from both India and abroad, over 400 research papers are to be presented at the conference, organised jointly by the Superconductivity Programme Management Board and the Department of Science and Technology. Around 450 delegates are expected to participate in the four-day conference. According to Prof. C.N.R. Rao, chairman of the Superconductivity Programme Management Board, the conference will help give a sharp focus to the research and development work in the field being conducted within the country as well as provide an opportunity for Indian scientists to interact with leading scientists from the advanced countries.

Three years after the phenomenon of superconductivity the world saw a sharp spurt of renewed interest following the discovery of superconducting compounds with high transition temperatures Prof. Rao feels the initial enthusiasm still continues. Pointing out the especially large-scale investments in the development of commercial devices using superconducting materials by major multinationals like the IBM, Du Pont, Hewlett Packard and the Japanese Matsushita Electric Industrial Co. and Fujitsu Ltd., he says a host of electronic and diagnostic devices are already being marketed abroad. While the manufacture of high power magnets and generators with the help of superconducting materials is still quite far off from present technical capabilities, according to him the near future is likely to see a wide application of sensor devices made with the new materials.

In India, owing largely to timely investments of a large amount of funds into superconductivity research for the past couple of years, at present over 58 groups in 31 institutions are working on different aspects of the subject. Since being set up in June 1987 the Programme Management Board has sanctioned nearly Rs. 19 crores to various institutions to set up infrastructure for research through two task groups one on basic research and the other on applications.

According to Prof. Rao, while the Indian researchers are on par with leading laboratories abroad on the basic sciences side, especially in the synthesis of superconducting materials and the study of their structure and properties, the country lags behind considerably in the industrial applications of the new technology.

This, he feels, is largely du lack of any work whatsoever o conductivity within the country 1987 and the consequent lack infrastructure and experience field. For example he points even liquid helium equipment, tially required for research in th was not available domestically til years ago.

Despite these constraints Pro expects prototypes of atleast two mercial devices, SQUID (superco ing quantum interference device infra-red detectors to be produced genously within the next one SQUIDS which will be used fo detection of magnetic fields of ver intensity for geological as well as cal purposes are being worked up two groups at the National Phy Laboratory. (See p. 62 for earlier ne

Workshop on Export Promotion for Dyes and Chemicals

The Gujarat Industrial and Technical Consultancy Organisation Limited and the Gujarat Dyestuff Manufacturers Association are jointly organising a two-day workshop on export growth opportunities for dyestuff/chemical producers at Ahmedabad on January 18/19, 1990.

The workshop is being sponsored by Industrial Development Bank of India (IDBI). Shri Ramu Deora, Chairman, Chemexcil will inaugurate the workshop and Shri K.U. Mada, Executive Director, IDBI will be the chief guest. The main objective of the workshop is to develop a culture of export orientation in existing units and to provide appropriate guidance in that behalf. The workshop is meant to provide to the participants a detailed idea regarding international market conditions, schemes of financial assistance, credit guarantee, export procedures and working of an export house. Besides, the participants will be ed cated on the policies & procedures various departments and institutio concerned with exports. Leadi experts in the field will share the knowledge and experience with parti ipants at the workshop.

The workshop will cover the fo lowing themes: 1. International mark for export from India. 2. India exports: Strengths and weaknesses. 3 Import export policies and procedures 4. Assistance from commercial bank and credit guarantee. 5. Experience o active exporters.

Entrepreneurs in dyestuff, dyestuf intermediate and chemical industries are welcome to attend this workshop. Those interested may contact: Gujarat Dyestuff Manufacturers Association, A-501-502 'Doctor House', Nr. Parimal Railway Crossing, Ellis Bridge, Ahmedabad 380 006. Phone: 404201.

FACT reviewing caprolactam unit

he FACT authorities in Kerala are ing a review of its Rs. 350 crore olactam plant set up with Holland's whow.

he plant was scheduled to start pro- tion in April 1989 and the latest cations are it may commence trial s only by May this year -- a delay nore than a year.

n letters written to the nylon indus- FACT is silent on the problems ing that plant though earlier they re talking of non-availability of spare ts. DGTD at Delhi, in talks on pply-demand of caprolactam, have en taking into consideration FACT's oduction from April 1989 but now the ,000 tonnes per annum caprolactam ant may come to full production only 1991. In letters to nylon spinners, the ACT management is silent on the fac- rs delaying the plant even as there a surmise that the international cap- lactam cartel may have a role to play. ut not all are prepared to bite this cuse and this points to poor plan- ng.

The delays come at a time when the ylon filament yarn units are facing me problems over regular supplies of e raw material. Against a total demand f around 45,000 tonnes per annum, the overnment has released foreign xchange to meet 60 per cent of the nport needs placed at around 39,000 nnes. Reports are the Finance Minis- y is likely to grant foreign exchange r an extra 10 percent and put a stop further releases. With GSFC supply- ng around 6000 tonnes per annum to Gujarat Nylons, its sister unit under a urious agreement with IDBI, the exist- ng nylon units have less supplies from GSFC.

Presently, GSFC caprolactam costs round Rs. 48 per kg. and reports are FACT may have to price its output at higher level owing to cost escalations nd delays. Caprolactam imports in 1988-89 are put at 40,709.61 tonnes valued at Rs. 11,165.57 lakhs while that in 1989-90 (April to October) is placed 16,100.80 tonnes valued at Rs. 4848.47 lakhs, indicating a drop. Output of nylon filament yarn in 1988-89 is put at 35,758 tonnes.

CENTRE TO MONITOR OCEAN POLLUTION PLANNED

A centre for monitoring ocean pollution is proposed to be set up by the Union government in Bombay.

This was disclosed by Prof. V.K. Gaur, Secretary, Union Department of ocean development, in Trivandrum on January 2, 1990.

The Bombay centre would be supported by smaller monitoring units to be set up in coastal states and island territories, Prof. Gaur said.

He was speaking on "Indian programme for ocean development in the 1990s" at a seminar on ocean science and technology, organised in connection with the annual general meeting of the Indian National Science Academy.

India being a country with 8,000 km. of coastal line and nine coastal states, the ocean could play a very important role in its future development, Prof. Gaur said.

In the new decade India would have to acquire better understanding of the ocean structures, which it was unable to in the last decade, and develop the exploration and exploitation of ocean resources, he said.

He said in the period ahead much attention would have to be paid on gaining greater understanding of the ocean circulation patterns, chemicals, biosystems of the ocean, evolution of shoreline dynamics and coastal dynamics.

NCL'S SINGLE STEP PROCESS

New tech. to make ethyl benzene

A revolutionary breakthrough in petrochemical process technology, for producing ethyl benzene from alcohol in a single step instead of from ethylene, called the 'Albene technology,' has been developed by the National Chemical Laboratory (NCL) Pune. It has been successfully translated into production on a commercial scale by Hindustan Polymers (HP) at Visakhapatnam, a unit of McDowell and Co. Ltd. of the United Breweries (UB) group.

This was announced recently by Dr. R.A. Mashelkar, director of NCL and Mr. R.B. Bhargava, president of the polymer division of McDowell.

Ethyl benzene is an important intermediate in the manufacture of styrene monomer, used in the production of polystyrene which is the feedstock for the plastics industry. For the first time there is a bright possibility of exporting this technology from India to other countries, Mr. Bhargava said.

Mr. Bhargava said the company had started a dialogue in 1985 about this catalyst, as they saw great potential in this process. Once they had a close look, they had no hesitation in trying it as their experience with the foreign technology was not very happy, he mentioned.

"We had problems of safety and had to import accessories for trying the earlier technology. We were also a little unsure of ourselves as adopting the NCL's technology meant stopping the production at the existing plan", he said.

Mr. Bhargava said that the NCL technology was efficient, conserved energy and could be engineered safely. The revamped plant which had a ity of 13,000 tonnes had alread duced 1500 tonnes of ethyl ben

Mr. Bhargava said HP had to about Rs. 1 crore in making chan the design of the plant to suit the technology. But considering the fits the unit had already produce management was even plannir export to countries which were r alcohol availability.

In all conventional steps ethyl zene is manufactured in two Alcohol is converted into ethylen then reacted with benzene. The s step reaction in UB-NCL's Albene cess involving alcohol and benze produce ethyl benzene offers advan of low operating cost and low ca investment. Dr. Paul Ratnasamy, de director of NCL and head of cata department said that NCL was cond ing research in making fuller use o available quantities of LPG.

News in Brief

IPORT-EXPORT POLICY CING REVIEWED

The government is reviewing the port-export policy to eliminate non-sential imports. This was stated in the ajya Sabha on December 28, 1989 by ommerce Minister Mr. Arun Nehru in ply to a question by S.S. Thakur and Ir. Yashwant Sinha whether the gov-rnment proposed to review the long-rm import-export policy with a view eliminating non-essential imports.

Mr. Nehru said that the review was eing undertaken in conjunction with ther related aspects which have a bear-ng on imports. The aims of the review ncluded enhancement of exports with articular reference to higher value-added exports, imports compression, and making available necessary inputs for the domestic economy in accordance with the government's developmental priorities, the minister explained.

STONE LAID FOR TPL PROJECT

The Tripura Governor Sultan Singh laid the foundation stone of the Rs. 124 crore methanol project of the newly formed Tripura Petrochemical Ltd. (TPL) at Uttar Brajapur in West district on December 27, 1989.

The gas based 300 tonne per day capacity unit, is the first of its kind in the State, which is likely to begin commercial production after three years. The unit is expected to promote a number of downstream industries.

The public-sector Rashtriya Chemicals and Fertilisers Ltd. (RCF), Oil and Natural Gas Commission (ONGC) and Tripura Industrial Development are jointly collaborating in the project, which will utilise more than 3.15 lakh cubic metres of natural gas.

Nearly 250 people are likely to get direct employment in the project. State Chief Secretary I.P. Gupta has been named the Managing Director of TPL.

GUJARAT WANTS MORE ROYALTY ON CRUDE OIL

The Gujarat Chief Minister, Mr. Madhavsinh Solanki, has urged the Prime Minister to consider urgently the memorandum submitted by the State Government in March 1988 for revision of royalty on crude oil.

In a telex message, Mr. Solanki said any arbitrary fixation of royalty would deprive the State's exchequer of its legitimate revenue. The Union Government had fixed the crude oil royalty rate at Rs. 192 per tonne from April 1, 1984, he said, adding that this rate did not reflect the intrinsic value of crude oil.

Mr. Solanki suggested that while fixing the new rate of royalty, oil producing states should be taken into confidence. He felt the matter of crude oil royalty was causing great concern in the state.

IBP NOMINATED FOR SETTING UP ASSAM REFINERY

The Government has "nominated" the State-owned IBP Company Ltd. for setting up an oil refinery in Assam, as part of the Assam accord.

The Assam Government will be the company's partner in the project, which is expected to go on stream within four years, according to the company's 81st annual report for 1988-89.

After almost half a century, the company will stage a "resurrection" and once again be in a position to have its own refinery base, which had been lost during the second-world war, the report said.

IPCL registers sales turnover of Rs. 1036 crores

The state-owned Indian Petrochemicals Corporation Limited (ICPL) has registered an impressive sales turnover of Rs. 1,036 crores in 1988-89 as compared to the mere Rs. 5 crores in 1973-74, the first year of its sales.

According to the 1988-89 annual report of the corporation laid in Parliament recently, the reserves and surplus of the company, which were a modest sum of Rs. 4.96 crores in 1973-74 had risen to Rs. 402 crores in 1988-89.

The corporation set a new record in its operation during the year under review by successfully establishing the viability in the use of plastic crates for apple packaging through the application of polypropylene copolymer (PPCP) by the introduction of 20,000 crates by Himachal Pradesh Marketing Corporation.

The developmental efforts of IPCL further conclusively revealed that the milk crates made from PPCP were superior to the crates made with high density polyethylene (HDPE), the report claimed.

Pointing out that the use of PPCP in automobile bumper compounds was developed, the report said an application base for use of plastics in furniture and in food packaging was also established. During the year, roughly 1,000 kms. of canal lining with agri-film was taken up.

In the field of chemical products, a new solvent cixon was introduced which would supplement the needs of rubber, adhesive and solvent industry. In the area of fibres, a market base was established for the corporation's dry spun acrylic fibre (supacryl). In collaboration with Khadi and Village Industries Commission, a project on handmade acrylic knitting yarn for use in amber charkha was launched in July 1988, the report said.

On new projects, the report said acrylic fibre expansion project of 12,000 tonnes per annum was commissioned and production of monocomponent fibre started.

The report said the mechanical completion of xylenes expansion project for raising the capacity of ortho-xylene unit from 21,000 to 45,400 tonnes per annum and that of paraxylene unit from 17,000 to 48,600 tonnes per annum was generally over. Integration of this new facility with the existing operating plant is slated for completion during the current year.

The report said the overall physical progress of the Maharashtra gas cracker complex as on end-March this year is 84 per cent and the cumulative expenditure incurred till the end of March this year was Rs. 906 crores.

The corporation is also establishing a carbon fibre pilot plant with associated product application development centre as part of its R and D activities at a cost of Rs. 31 crores with a foreign exchange component of Rs. 13.23 crores.

OIL TO BEGIN DRILLING OFF SAURASHTRA COAST

Oil India Ltd. (OIL) plans to take up exploratory drilling for oil in the Saurashtra offshore area after the monsoon. The company has drawn up a three-well programme for drilling in the area, for which it is getting a petroleum exploration licence (PEL). Though the petroleum ministry has already communicated its decision to give the PEL to Oil India, the exact demarcation of the area to be given to Oil India is yet to take place because of claims to certain parts of the area made by the Oil and Natural Gas Commission (ONGC).

Oil India has already opened a project office at Rajkot and issued inviting tenders for exploration first well is planned to be drill 1991-92 and the next two wells ov next year. The total amount plann be spent on exploration and drilli the area is estimated at Rs. 78 c

Locations for drilling will be de on the basis of fresh surveys an data about previous exploratory ef made in the area are being obtaine Oil India from ONGC.

It may be mentioned that the company -- Chevron -- was award concession in the area and it dri three wells during the 1982-84 per Two of the wells were drilled to middle miocene shale formation. well was drilled to a depth of 4,4 metres and the other to 3,600 met Both the wells proved dry. Howev the third well drilled to a depth of 1,8 metres indicated presence of minor g

In the adjoining Kutch offshore ar exploratory drilling has been carried o by the U.S. company -- Reading a Bates -- as well as by ONGC. Readi and Bates had drilled two wells in t Kutch basin in 1976 and 1977. The fi well had shown some indications of o and gas while the third well showe only minor traces of gas. ONGC foun some oil in the Kutch basin in a we drilled by it in 1984.

NYLON CORD PRICES CUT

The prices of nylon cord has bee slashed by about Rs. 2,100 a tonne b the manufacturers with effect from Jan uary onwards. According to the Asso ciation of Synthetic Fibre Industry (ASAI), the revised price of nylon tyre cord fabric would be Rs. 128 to Rs. 130 a kg. depending upon the quality/spe cification. Although the reduction in c.i.f. price of caprolactam is substantially neutralised by higher dollar/rupee parity, the industry has passed on the benefit of reduction to manufacturers claimed ASFI.

16-crore cyclotron project for Madras

Nuclear medicine in the country is ed for a quantum leap, with a Rs. 16 e project to produce high energy npact cyclotron to be set up in dras.

The high-tech project is part of a lear science centre to be set up ntly by the Indira Gandhi Centre for omic Research (IGCAR), Kalpak-n and the University of Madras. The nned facility is to come up at Tar-ani, where the university has land to cate a project of this size.

Cyclotrons provide short-lived pos-on emitting nuclides, used in the PET an system: three dimensional Positron nission Tomography (PET) monitors e functioning of vital organs in a non-vasive fashion, proving invaluable in rdiology, oncology and neurology to etermine the status of the heart and rain.

There is no PET system in the coun-y now, and Madras doctors are con-ident that the joint project will be iable.

A cyclotron with an attached PET ystem also meets the requirements of he radioisotopes which have a very hort shelf life.

Besides, the project envisages supply of isotopes to several hospitals in the egion, including the Cancer Institute, he Madras Medical College Hospital, and Apollo and KJ hospitals in the City. Others who could benefit are CMC, Vellore, the Regional Cancer Centre, Trivandrum, hospitals in Bangalore, Sringeri, and Manipal besides Apollo and Nizam, Hyderabad.

These hospitals already have single photon emission computerised tomog-raphy (SPECT) systems for scanning and they need the isotopes to operate them.

Linear electron accelerator: Provision of a linear electron accelerator is also part of the project. Radiation effects on biological systems can be studied with the help of the accelerator. It will encourage research into radiation chemistry, especially mechanisms of reactions arising from interaction of radiation with chemical systems.

The Nuclear Science Centre will also strengthen research using lasers, trace analysis, and radiation biology.

A pico-second and a nano-second laser with associated facilities are also envisaged under the project. Trace Analysis, used in characterising ultra pure materials, environmental monitoring and industrial quality control, is also being given a boost.

The radiobiological lab will have facilities for work on radiation biology, ecology, genetics, and physiological ecology. Gamma radiation source, DNA sequencing and chromosome mapping equipment are the highlights.

The project has been given the green signal and the university senate is to vote a Rs. 2 crores grant for the buildings. The centre will be under the joint control of the Department of Atomic Energy and Madras University, manned by a 35 member team, including 15 engineers and technicians, two scientists, and a medical officer specialised in nuclear medicine.

IGCAR has pointed out in the project paper prepared by Dr. C.K. Mathews (IGCAR) and Prof. P. Natarajan (Madras University) that three or four accelerators now available fall in the KeV range, and it is necessary to have a high current medium energy cyclotron in the MeV range.

A compact machine from Belgium, the "Cyclone-30" is preferred by the scientists to a Japanese machine. Though both are in the MeV range, the Belgium machine has higher intensity.

The proposal for the chemistry oriented nuclear centre is a step further in the ongoing collaborative agreement between Madras University and IGCAR, Kalpakkam.

SUITABLE POLICY FOR PLASTIC SACK UNITS URGED

The All India Flat Tape Manufacturers Association has called for evolving suitable short-term and long-term policy guidelines for the survival and growth of the plastic sack manufacturing units.

In a memorandum submitted to the deputy chairman of the Planning Commission, Mr. Ramakrishna Hegde, the president of the Assocaition, Mr. Tikam Patni has stated that owing to the compulsory use of jute bags, the cement and fertiliser industry were incurring additional packing costs of Rs. 176 crores and Rs. 120 crores respectively.

Massive losses are also being sustained by these industries consequent to the spillage and spoilage of commodities packed in jute sacks.

"Despite this, it is strange that the report of the sub-group on jute industry for the Eighth Plan has recommended the continuation of the mandatory jute use order through the year 1994-95", Mr. Patni stated. According to him, the report of the jute sub group relating to the compulsory use of jute sacks should be kept in abeyance. A financial survival package should be developed to avoid permanent closure of the plastic sack manufacturing units, he said.

ACTING CHIEF FOR HPCL

Mr. S.T. Bambawale, Director, personnel and administration, has been asked to take additional charge as Chairman and Managing Director of Hindustan Petroleum Corporation Limited. The post fell vacant after the retirement of Mr. M.K. Bagai will be filled in due course through normal governmental procedures.

GNFC pays 10 per cent

Gujarat Narmada Valley Fertilisers has declared a dividend of a rupee per equity share of Rs. 10 each for the year 1988-89. This was disclosed by Mr. Rohit Mehta, Chairman, GNFC while addressing the annual general meeting of the company at Broach on January 1. It may be recalled that the company had passed over the dividend but now it has revised its earlier proposal.

He disclosed that the company could get the permission from the Company Law Board for providing depreciation at lower rates following the representation made by the company. He stated that there had been a wide gap between the depreciation provided by the Companies Act and the depreciation available to it under the revised RPS with the result that the company had not been in a position to declare any dividend for the year 1988-89.

According to him an amount of Rs. 27.27 crores will be available for appropriation. The Re. 1 dividend will work out to 13.33 per cent on an annualised basis.

Mr. Mehta pointed out that the convulsive effect of changes in the RPS of the Union Government has affected profits of GNFC during 1988-89 (nine months) despite record production and sales during the period. The norms of capacity utilisation and the life of the plant for calculation on depreciation have reduced the gross profit of the company by Rs. 43 crores.

Mr. Mehta also informed that the Union Government had approved the foreign collaboration for its TV glass sheet project with OI-NEG TV Products, Inc., USA to be set up by the Gujarat Narmada Valley Fertilisers Company Ltd.

He added that a separate company had been set up for this purpose and the foundation stone was laid only in October last year. Construction work will be started after getting approval from financial institutions, he added.

Discussing the progress at GNFC, Mr. Mehta informed that the promise to commission three projects during 1988-89 had been fulfilled. GNFC had commissioned its captive power plant phase II 25 MW, India's largest formic acid plant 5,000 mtpa and the country's largest printed circuit board plant with annual capacity of 44 sq. mtrs. The performance of captive power, butachlor and EPABX plants are commendable. The formic acid plant operation has also stabilised and GNFC has entered the export market amidst severe international competition.

The concentrated nitric acid plant in the prestigious Rs. 237 crore nitrophosphate project was commissioned in October 1989. With the completion of the weak nitric acid and ammonium nitrophosphate plants in the firs 1990, the project will be on stre Rs. 75 crore methanol expansi ject will be completed by the 1990.

The phosphoric acid project, venture with the United Arab Er is under implementation. The N 150 Prince scooter produced by Narmada Auto Ltd. (GNAL), a owned subsidiary of GNFC has achieved a large market share eral parts of the country. New of scooters and the three wheele mada Elegant are being launch 1990.

Mr. Mehta mentioned that GNF made a world record of achievin per cent capacity utilisation in th oil based ammonia plant during th 1988-89. The capacity utilisation urea plant was 122 per cent where methanol plant performed at a le 141 per cent.

In fact, GNFC had sold 6.37 tonnes of urea during the pe 1988-89 (nine months) inclu imported fertilisers as compared to lakh tonnes for the previous fina year of 12 months. In this for the months period, the sale of 5.95 lakh of urea resulted in an increase of 6 cent on annualised basis. The revenue of the industrial prod amounted to Rs. 23.88 crores w came from sales of ammonia, metha nitrogen etc.

BICP, Ministry spar on adding drug R & D cost

The Drugs Ministry and Bureau of Industrial Costs and Prices (BICP) disagree on loading of research costs in calculating drug prices. The ministry wants to include the full costs of research in the prices of controlled bulk drugs, while BICP is prepared for only a 50-per cent load factor. The divergent approach has stalled a decision on the issue which is critical to at least some drug companies.

Industry is rather surprised over the BICP stand as it usually does not take policy stands. Perhaps, BICP feels the current mark-ups of 75 and 100 per cent on price-controlled formulations cover a large portion of research costs. The mark-ups, though liberal, are partly eaten away by trade margins, disputing the analysis of BICP.

At the last OPPI meeting, Mr. M.S. Gill, the Pharmaceuticals Secretary, had talked of a Government decision to fully reimburse research costs. Except for Hoechst, there is virtually no other company which invests on basic drug research. After investing around Rs. 4 crores per annum Hoechst research centre has not been able to land upon any drug to recover costs. A favourable decision will help this company as much as others, who have been laying emphasis on process research.

By designing new processes a large number of Indian companies have been able to launch new drugs. In fact most of the drug companies with foreign equity have no basic research facilities.

NEW STRATEGY TO CONTROL AIR POLLUTION

The Ministry of Environment and Forests has evolved a comprehensive strategy to effectively control air pollution through emission of lead, carbon monoxide, nitrous oxide and hydrocarbons by automobiles.

The approach involves shifting to the use of lead-free petrol, design modifications for automobiles and strict monitoring of emission standards. An official release recently quoted the Minister of State for Environment and Forests Mrs. Maneka Gandhi, as emphasising the need to shift to lead-free petrol to prevent health hazards due to high lead content in air.

Speaking to Doordarshan, Mrs. Gandhi said the nation could not afford to suffer the deleterious effects of mental retardation and progressive diminution of height of the offsprings due to high lead content in the blood. A plan to reduce lead content in petrol to the accepted 0.15 grams per litre by 1993 is under active implementation which could be preparatory to shifting to lead-free petrol, the release added.

GARWARE POLYESTER BAGS R & D AWARD

Garware Plastics and Polyester received the national award for indigenously developing the technology for medical and industrial X-ray films. The award was presented by Mr. M.G.K. Menon, Union Minister for Science & Technology at the inaugural function of the Third National Conference on In-House R & D, organised jointly by the Department of Scientific and Industrial Research, Government of India, and the Confederation of Engineering Industry in New Delhi on December 31.

Up to now, only a few companies like Kodak, Du Pont, Agfa and Fuji had the technology for making X-ray films, Garware's indigenus development of this technology marks the first time that this technology has been developed in any third world country. The entire process, right from making the polyester chips, extruding the film base along with a blue dye to make it suitable for photographic use, manufacturing the silver halide emulsion used, an coating process had been deve entirely in-house. The medical f nity all over the world prefers the polyester-base film, as it has less absorption and does not curl. Al makes sharp, clear images.

R & D AWARD FOR BHEL

Bharat Heavy Electricals Ltd. been selected for the national awar research and development effort industry for 1989, for the second secutive year. Instituted by the Dep ment of Scientific and Indus Research, BHEL's Bhopal unit has the award in the electrical indust sector. Earlier, BHEL's Trichy unit the award in the mechanical and a motive section. The award will presented by the Minister of State Science and Technology, Prof. M.G Menon to Mr. S.K. Handa, Gene Manager in-charge, BHEL, Bhopal

NEW PROTECTION SYSTEM FOR ONGC PIPELINES

A fully powered cathodic protecti system by solar energy for providi protection to gas pipelines of the Oil a Natural Gas Commission from cor sion has been commissioned. The ne system, replacing the conventional pra tice of preventing corrosion with t "impressed current system" through re tifiers has been introduced for the fir time in the country. The new syste developed by the Central Electronic has been commissioned in the weste region of ONGC for the Dabk Duvaran pipeline. The system will b adopted on the ONGC's differen underground trunk pipeline. By switch ing over to the new system, ONGC wi be saving consumption to the tune o Rs. 3 lakhs per year in this sector alone The existing system has two disadvan tages: It needs uninterrupted powe supply and close monitoring of cross country trunk pipelines and availability of direct current which is not possible everywhere. The new system over comes these disadvantages.

MCF revival: Karnataka accepts RCF proposal

The Karnataka Government has ided to unload 51 per cent of its ity base in the Mangalore Chemi- s and Fertilisers Ltd. (MCF) in our of the central sector Rashtriya emicals and Fertilisers Ltd. (RCF) in w of the former's mounting losses.

Addressing a press conference in ngalore at the end of a Cabinet meet- g, the State Information Minister, Mr. erappa Moily, said that the accum- ated losses of MCF, which stood at s. 23 crores last year, is expected to up to Rs. 50 crores by March 1990. ven the required investment for replac- g its outdated plant and machinery had roved beyond the means of the com- any. Hence, the State Government has ecided to accept RCF's proposal for ICF's rehabilitation, the Minister xplained. The rehabilitation proposal, ubject to the approval of the Union and State Governments, envisages RCF holding 51 per cent of the equity base, raising Rs. 60 crores for immediate requirements, providing working capital, if necessary, and "taking a flexible stand and investing Rs. 200 crores to Rs. 300 crores" in modernisation by RCF.

MMTC CUTS COPPER, TIN PRICES

The Minerals and Metals Trading Corporation of India announced recently a reduction in its selling prices of copper, tin and nickel. A release of the Corporation said that price of copper had been reduced by Rs.1,500 per tonne, of tin by Rs. 3,000 and of nickel by Rs. 4,000.

The prices of copper, tin and nickel have been reduced due to fall in international prices, it adds. The prices of zinc and lead remain unchanged at last month's level.

The ex-godown prices for sale from all godowns of the Corporation excluding sales tax, octroi and the like which are extra at actuals are (per tonne): Electrolytic copper wire bars 82,000; Copper cathode 79,955; Continuous cast copper wire rods 88,500; Electrolytic high grade zinc 50,500; Special high grade zinc 50,700; Pig lead 99.97 per cent purity 29,500; Pig lead 99.99 per cent purity 29,700; Tin 2,97,000; Nickel birqs/SQ + pellets 3,64,000 and Nickel strips/F shots 3,66,000.

MADRAS REFINERIES

The Madras Refineries Ltd. has submitted a detailed feasibility report for setting up facilities for the distillation of 500,000 tonnes per annum of crude oil and separation of 16,500 tonnes per annum of LPG from the associated gas in the Cauvery basin.

Shell to invest Rs. 400 cr. in NOCIL

The Royal Dutch Shell of the Neth-nds has agreed to invest Rs. 400 res including a hike in equity stake National Organic Chemical Industries . (NOCIL) from 32 per cent to 40 cent to part-finance its Rs. 1,700 re expansion.

f all goes well, it will be one of the gest foreign investments in the pet-chemicals sector of the country for a g time. It also underlines Shell's con-ence in running safely an ethylene cker plant based on naphtha despite ough court judgement on industrial cidents.

Shell and NOCIL have come to an nderstanding whereby the former will rgely finance the foreign exchange mponent with any shortfall being met y commercial foreign loans floated by OCIL. In the letter of intent, the Gov-mment has refused to underwrite any ommercial loan or borrowing arrange-nent and added that dollars will have o be earned by NOCIL through xports.

NOCIL is confident of self-financing s imports by exports with Shell chip-ing in with the marketing network.

Reports are Shell is keen to raise its quity stake beyond 40 per cent but this ould raise a hassle and NOCIL is not een. Further, an equity hike to 40 per ent should not face any Government roblem. By taking up a 40 per cent quity stake, Shell could have a little more say in the management and the board may have to be expanded to accomodate new entrants. But the com-pany sources feel this should not affect operational freedom of Mr. Arvind Mafatlal, Chairman. The sources admit naphtha may have to be imported if local availability shrinks and this could be serviced by a targeted annual exports of Rs. 100 crores that NOCIL is work-ing on.

Both parties are working out details and firm financial proposals will surface by middle of this year for work to start sometime early next year. Shell is vetting its financial involvement through various committees even as managers at Mafatlal House toothcomb problems and solutions.

Recently NOCIL got a letter of intent to expand its capacity with an investment of Rs. 1,700 crores, the ethylene capacity is to be pushed up from 63,000 tonnes per annum to three lakh tonnes per annum, of propylene from 37,000 tonnes to 140,000 tonnes per annum apart from that of 16 other petrochemicals and intermediates. As the expansion comes through, the Thane complex output is expected to jump from 247,000 tonnes per annum to a whopping 1.39 million tonnes per annum.

And that is precisely the problem NOCIL management is still facing. As the letter of intent gets converted into an industrial licence, the shrill voice of environmentalists is bound to get shriller.

The issue is lying in the courts and a final decision will influence the Government's Environment Ministry. Company sources are hopeful of a favourable decision and Shell is working on that promise.

INDO GULF FERTILISERS

Indo Gulf Fertilisers and Chemicals Corporation has earned a gross profit of Rs. 30.65 crores during the six-month period ended September 1989 on net sales of Rs. 152.23 crores. As the project was under construction during the corresponding period last year, there were no sales and profit figures for the period.

With the provision for depreciation being Rs. 33.69 crores, there is a loss of Rs. 3.04 crores during the period.

Quantum jump in knowhow exports: a far cry

A quantum jump in the export of technology is difficult to achieve, although over the years India has developed a good infrastructure and expertise for planning and executing a wide variety of projects, according to Mr. D.S. Arora of the Indian Institute of Foreign Trade.

This is because manufacturing units and consultancy units spread over a fairly wide area are suffering from numerous problems on account of infrastructural deficiencies and ignorance of overseas technological requirements in terms of quality, specifications and cost.

Of nearly 200 consultancy firms, only about 20 are engaged in export business. The same is the situation with regard to project and capital goods exports.

Further, although India had successfully sold some simple and labour-intensive technologies to a number of developing countries in the past, there had been a distinct shift in their requirements.

This is due to greater exposure of newer processes and equipment from our counterparts in other countries, according to Mr. Arora.

This problem is, however, more acute in areas where the demand for a particular knowhow or machinery item has reached a saturation point.

The only alternative for survival in such a situation would be laying more emphasis on newer industrial processes, improving engineering designs and making construction methodology more efficient.

Another important factor, Mr. Arora identifies, is the lack of a proven track record in executing large projects. Indian image is not quite bright in the Gulf countries, according to him.

Again some of the clients in these countries are interested in awarding project work on package service basis, which many of the Indian companies are not able to undertake.

As per current indications, the complexities of new projects emanating from this region are, however, growing both in terms of size and cost.

With a view to successfully completing the whole job and taking benefit of overseas project business, Indian units are specialising in different activities to come together and form consortia.

In the circumstances there is an urgent need for integrated strategy aimed at establishing a stronger technology base which would inject a qualitative change and confidence in this growth area, so that it can successfully sustain itself in the changing requirements.

SUPERCONDUCTOR DEVICE FABRICATION IN A YEAR

The country's first superconductor device with commercial applications will be fabricated in a year.

The device could be in the form of the SQUIDS (superconducting quantum interference devices) used in geoprospecting for minerals and medical diagnosis, or the IR Detectors. While the National Physical Laboratory (NPL) in New Delhi and the Indira Gandhi Centre for Atomic Research have been assigned the task of making the SQUIDS, scientists at the Central Electronics Engineering Research Institute at Pilani are working on the detectors.

The fabrication of these gadgets figure in the list of priorities drawn up recently by the National Progr Management Board (PMB) on s conductivity.

The Chairman of the Board Director of the Indian Institu Science (IISE), Prof. C.N.R. Rao that efforts to manufacture mag generators and superconducting and tapes would also be accorded ority. With these endeavours, the c try would be able to rise to internat levels in the area of supercondu applications.

Prof. Rao said the country's lab tories had done reasonably good w in the area of basic research. Superc ductors with temperatures as high 125K (minus 148°C) were being m However, lack of adequate infrast ture and the onus on scientists to s thesise the superconductors, study th characteristics and carry out vari measurements all by themselves w impeding research. "In most of the ot labs in the world, if somebody mak a new compound, there will be 1 others doing various measurements," added.

He said that so far, the Board h released Rs. 18 crores to improve t quality of facilities in various insti tions. The Board would require abo Rs. 100 crores to build all the labs fro scratch.

Prof. Rao said work was also on circumvent problems of current densi (current carrying capacities) and magn tic flux lattices. He was confident th some process would be evolved to ove come these problems.

He said PMB in collaboration wit the Department of Science and Tech nology (DST), would organise a four day international conference on super conductivity in Bangalore from Jan. 10

A number of scientists of interna tional repute would attend the confer ence, he added.

NCING PETROCHEM PROJECTS

Thapars to revive scheme

e Delhi-based house of Thapars is to revive an earlier financing me for large petrochemical projects involves no foreign exchange o.

an innovative move, the Thapars tied up with Russian firms for set-up petrochemical complexes in the ntry. The Soviets had also agreed to ide plant and machinery to the Tha- in Indian rupees and were even ing to import technology not avail- e in the USSR from the western ntries and provide it to India against ee payments.

The Russians were also amenable to oviding soft loans to the Indians at erest rates not exceeding five per cent annum.

The Thapars first mooted this technology-cum-finance package while bidding for the aromatic complex in Saleempur. The proposal included turnkey erection by the Russians and incorporated the import of the PTA technology from France — to be paid for in Indian rupees. The Thapars, however, were late in submitting their proposal and, therefore, lost out to the Singhanias.

After Saleempur, the Thapars told the Union government that the Russian package was available to all petrochemical projects that required government sanction. However, on account of the different set of priorities of the previous government and due to the impending general elections, the proposal was not considered seriously. The Thapars have now thought of reviving the proposal in the face of severe foreign exchange crunch faced by the country. The new government is likely to call for a reappraisal of projects in the energy and petrochemical sectors which involve very heavy drain on foreign exchange. Already an empowered group has been set up in the Planning Commission to see if some of these hard currency-intensive projects can be deferred.

While it is claimed that Russian technology may not be at par with what is available in the western countries, the cost benefits of rupee payments and soft loans will easily turn the scales in favour of the Soviets. This is especially true in the context of the foreign exchange crunch.

Meanwhile, one of the group's flagship companies JCT Ltd., plans to put up a Rs. 600 crore PTA plant in Punjab. It had already tied up with the Punjab State Industrial Development Corporation (PSIDC), and an application is expected to be made to the government for a letter of intent.

IOC refineries at Paradeep, Karnal

The Indian Oil Corporation will set up two grassroot oil refineries of six million tonnes per annum each at Paradeep in Orissa and Karnal in Haryana.

Besides, the State-owned IOC plans to increase substantially, production capacity in the refineries at Barauni in Bihar, Haldia in West Bengal and in Assam and Gujarat to cope with the growing demand during the Eighth Plan, an official release said in New Delhi recently.

The proposed six-million-tonne refinery at Paradeep will be based on imported crude. After conducting detailed studies of the supply and demand position and infrastructural facilities, IOC has submitted a feasibility report on the grassroot refinery at Paradeep to the Ministry of Petroleum and Chemicals. It was now under the "active consideration" of the Government, the release said.

IOC was "actively pursuing" the six-million-tonne Karnal project, which is expected to help close the growing deficit of petroleum products in the north-west region.

Crude availability from the western on-shore in Gujarat is also expected to increase from about six million tonnes now to 9.7 million tonnes annually by 1994-95, according to the report of the sub-group of the Planning Commission on 'Exploration and production —Eighth five-year Plan'.

The organisation was considering low-cost expansion proposal of the Gujarat refinery by three million tonnes per annum to absorb the additional crude availability from the western onshore fields, the release further said.

Proposals for expansion of the refineries and setting up of the grassroot refineries have been included in the report of the subgroup on 'Refi Eighth five year Plan'. The capa the corporation's refineries in th ern sector processing Assam cr expected to go up to 7.2 million per annum by 1993-94 from the ing capacity of six million tonnes ally.

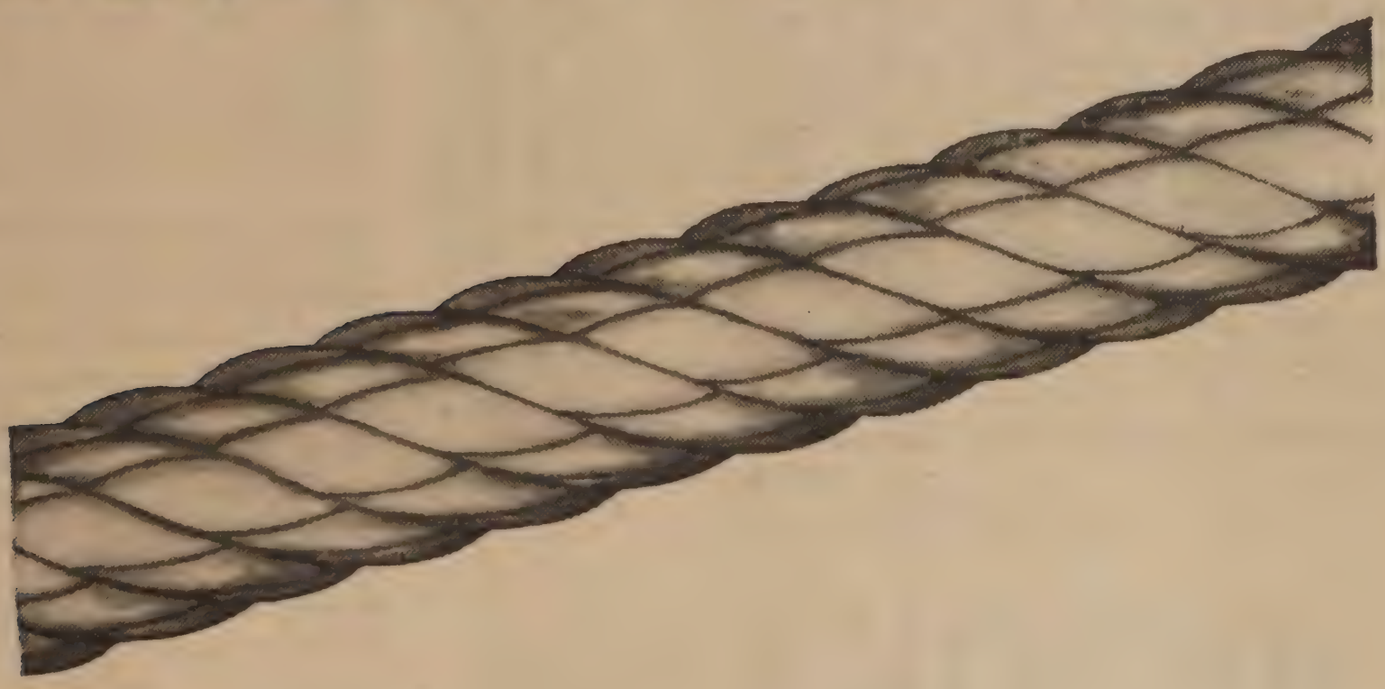
With the commissioning of th posed grassroot refinery in Assan a capacity of three million tonne year, the entire anticipated crude duction in the north-east of ten m tonnes annually would be fully uti

The refining capacity in the ea sector has always been adequate to cess the total crude produced in north-eastern region. The expan plans also provide for petroleum ducts in the country for enhancing capacity of the Mathura refinery f six million tonnes to 7.5 million ton the Gujarat refinery from 7.3 mil tonnes to 9.5 million tonnes and Haldia refinery from 2.5 million ton to 2.75 million tonnes per annum added..

UNIQUE OIL TO BRING IN ADVANCED TECH. FOR DRU RECONDITIONING

Unique Oil India Ltd., which for first time ushered into this country sophisticated West German technolo -- the Bernd Meinken process -- for scientific refining of used lubricati oils, has now scored another first to credit. It has inducted yet anoth advanced technology for automa reconditioning of drums, according Mr. Yogesh Khosla, Unique's direct The company has installed an autom tic drum reconditioning plant, import from UK at Tarapur in Maharashtra few days ago. The new plant is a maj leap forward from the crude indigeno process of reconditioning the drum which frequently led to unexpected le kages and bursts resulting in heav losses to the industry, Mr. Khos said.

TAKE THE DETERMINED LINE



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SI Viscose bids for MPCL

South India Viscose Limited, Coimbatore, is interested in taking over the sick Madras Petroleum and Chemicals Limited (MPCL), now awaiting a revival package from the Board for Industrial and Financial Reconstruction (BIFR). At the first meeting convened by the Board in Delhi early last month, SI Viscose offered to present a detailed scheme within a month for acquiring MPCL.

The entry of the Coimbatore-based textile giant with a turnover of over Rs. 50 crores on the scene has surprised even financial institutions and banks. For, both the fund bodies and banks had taken it for granted that 'MPCL' (formerly Nagpal Ambadi Petroleum Refining) will be merged with the public sector Madras Refineries Ltd. (MRL) by virtue of the close links between the two companies.

The managing director of MPCL is a nominee of MRL. Moreover, it depends on the public sector company for the supply of certain feedstocks. MPCL is mainly engaged in the manufacture of transformer oil, white mineral oils and petroleum jelly. Its operations have suffered a setback from 1986-87. It owes a staggering Rs. 19 crores to the institutions and banks.

While applying to BIFR in August last year, MPCL mentioned that MRL would be an ideal choice for acquiring it. It explained that its viability could be restored by diversifying and taking up manufacture of some value-added products. Subsequently, in November, in anticipation of BIFR clearance for the merger, MRL and IDBI, the lead institution, signed an MoU for acquiring the assets of MPCL by MRL.

Now it appears that the public sector company will not have a cake-walk. A clear picture, however, is expected to emerge in the next sitting. It is understood that BIFR itself has not favoured the merger with MRL ... ing in view the interest of min... shareholders and the magnitud... MPCL's unsecured loan.

In a related development, the b... has named ICICI as the oper... agency in the case and has asked ... prepare a revival scheme. Earlier, it ... thought that IDBI would be entru... with the task. Meanwhile MPCL ... approached the banks concerned ... releasing fresh funds to arrest ... losses.

GAIL PETROCHEM UNIT IN ...

The Gas Authority of India ... (GAIL) has been permitted to set u... petrochemical complex in Auraiya ... Uttar Pradesh. According to a Gove... mental review of annual report and a... ited accounts of GAIL for the y... 1988-89 tabled in the Rajya Sab... recently the petrochemical complex ... have gas processing and cracking fac... ties alongwith downstream units. ... detailed feasibility report is being p... pared in this regard.

GAIL has also taken up for distrib... tion natural gas for domestic and co... mercial use in Greater Bombay. ... techno-economic study for gas distrib... tion in Delhi, Kanpur and Noida is bei... carried out. GAIL has completed t... entire pipeline laying work of t... Hazira-Bijapur and Jagdishpur (H-B-J... However, the compressor stations ar... telecommunication are expected to b... completed by the first quarter of 199...

NEW REGIONAL DIRECTOR FOR ONGC

Mr. V.C. Mohan, officer on specia... duty, Oil and Natural Gas Commission ... Bombay, is taking over as regiona... director, ONGC, southern region ... Madras. Mr. N. Krishnamurthy, who ... was acting regional director in Madras ... has left.

DELAY IN GAS PIPELINE PROJECT

ONGC threatens to cash Saipem's $1m bid bond

The Oil and Natural Gas Commission (ONGC) has threatened to encash the one-million dollar bid bond of the Italian company Saipem for the Rs. 140-crore gas-lift pipeline network project for Bombay High for failure to proceed with the contract. The letter of intent for the contract was given to Saipem by ONGC in July 1989. However, for various reasons the "kick-off" meeting between Saipem and ONGC, which would have signified the acceptance of the contract by the bidder, has not yet taken place.

The threat has obviously been held out to bring the Italian company round to adhering to the terms of the contract. If the threat fails, ONGC would be free to invite bids for the contract. Though Essar and Saipem were in a neck-and-neck race for the contract, the offer of $32 million of Italian credit on soft terms to meet the bulk of the foreign exchange component of the project, estimated at $37 million, tilted the scales in favour of Saipem.

However, the protocol agreement for financing the project between India and Italy, has not been signed so far owing to political changes in Italy. Pending the signing of this protocol, it was proposed that ONGC should make the payment out of free foreign exchange even for the Italian-origin goods and services for which the Italian soft credit was to be made available.

The amount could be disbursed to ONGC once the Italian credit was made available. This would have caused some interest loss to ONGC, which Saipem was not willing to reimburse. Another problem between ONGC and Saipem in regard to this contract pertains to customs duty and responsibility for customs clearance. During negotiations, Saipem refused to bear the burden of customs duty. ONGC agreed to bear the customs duty with a corresponding reduction of $12.30 million in contract payments, reflecting the estimated amount of customs duty. Saipem, however, also wanted ONGC to take the responsibility for customs clearance of imported goods which ONGC was not willing to bear.

It is now clear that the gas-lift pipeline network project will be delayed. According to the original schedule, the project was to be completed by December 1990. The scope of the contract would suggest that no company would be able to complete it within this time frame. The project scope includes design, engineering, procurement, fabrication, load-out, tie-down, transportation, installation, hook-up, testing and the pre-commissioning of 40 pipeline segments totalling about 180 pieces.

It also includes extension of pipeline risers and installation of valves on the well-head and process platforms. Certain modifications to the platforms' dock piping for pumping compressed gas to shore were also to be carried out as part of the project.

DECISION ASSURED ON MANGALORE REFINERY BY FEB. '90

The Centre has assured Karnataka that a final decision on the implementation of the Mangalore refinery and petrochemical project would be taken by February this year, according to the Karnataka chief minister, Mr. Veerendra Patil.

Mr. Patil said he had separate meetings with the Prime Minister Mr. V.P. Singh and the Petroleum and Chemicals Minister Mr. M.S. Gurupadaswamy. During the course of discussions they had given the assurance that the projects would be expeditiously cleared, he said.

Stick to gas crackers

There is a lot of excitement in Calcutta about the Haldia petrochemical complex. For the first time in decades the country's biggest industrialists are vying with one another to invest thousands of crores of rupees in Haldia. Alas, neither the euphoria of Mr. Jyoti Basu nor the enthusiasm of the industrialists is justified at this stage. At a time when Plan resources and foreign exchange are in short supply, the Haldia petrochemical complex must be high in any economist's short-list of Eighth Plan proposals that should be axed.

For a start, the country needs only a limited amount of petrochemicals. The IPCL's gas cracker at Nagothane with a capacity of three lakh tonnes is virtually complete, and is being expanded to four lakh tonnes. Reliance has already been licensed for three lakh tonnes at Hazira, NOCIL has got the green signal to expand to three lakh tonnes and new public sector crackers of three lakh tonnes each are coming up at Gandhar and Auriya. In these circumstances there is simply no case for any more crackers at Haldia or Visakhapatnam. The last thing we need at a time of scarce resources is to invest thousands of crores in unwanted petrochemical capacity. It is better to err on the side of caution in such mega-investments.

West Bengal might argue that some of these gas-based crackers should be abandoned, and Haldia should be given priority. After all, say Bengalis, Haldia is conceptually one of the oldest projects. However, we must give preference to gas-based crackers, for we are already producing gas that is rich in the higher fractions suitable for cracking. This gas cannot be exported, and is currently being burned in boilers. This represents a scandalous waste of scarce resources that must cease. Naphtha is soon going to be in short supply in India and will have to be imported. There is no case for spending foreign exchange on imported naphtha when domestic substitutes are being burned. Indeed, apart from the gas-based crackers at Hazira, Gandhar and Auriya, we should have one in the north-east, where so much rich gas is being flared today. Chemicals from the Assam cracker should logically be sent to West Bengal for conversion into consumer goods. That will give far more employment to West Bengal than a cracker.

Assam is capable of supporting at least one cracker of three lakh tonnes capacity possibly two. Besides, gas production in Bombay High has risen very fast because of the increasing gas-oil-ratio. This means that much more associated gas (which is rich in the higher fractions suitable for cracking) is available than once expected. Engineers India Ltd. has found in a project report that if enough gas is available in the HBJ pipeline, a second cracker at Vijaynagar will be an excellent economic proposition. Again, offshore gas production from the Krishna-Godavari basin is rising, and may soon be able to sustain a cracker. In short, we probably have enough gas for cracking till the end of the century. Only after that should we consider naphtha-based crackers at places like Haldia and Visakhapatnam.

-- Financial Express

PROSPECTS BRIGHT FOR OIL RESERVES

The possibility of discovering additional oil reserves in the Cauvery basin is "very bright" according to Oil and Natural Gas Commission (ONGC) sources. The PY-3 discovery made in August and the four exploratory wells drilled since then have established oil reserves in the Cauvery basin to the extent of 22 million tonnes. Further exploratory drilling in and around the PY-3 structure is in progress the sources said.

A detailed scheme, estimated to cost over Rs. 235 crores has been prepared for the development of the PY-3 ture on the Cauvery offshore. The ture located in the Portonovo are be put into production using a based production facility, the s said. The scheme envisages constr of a four-legged well platform, s flow lines, drilling of two or three through template and a charter jack-based facility for producing 2 barrels of oil per day and one m tonnes per annum.

Also being planned are 0.5 metres of gas per day, subsea oi associated gas pipelines to the s onshore oil and gas terminals and support facilities. Exploratory we the Cauvery Basin will be utilis products with subsea completion maintain a plateau production ra 17,100 barrels of oil per day, a ga for the field is being planned, the s ces said. Meanwhile, the target for c production in the Cauvery Basin fo terminal year of the Eighth 1994-95 has been hiked to 3.5 mil tonnes from the original target of million tonnes in view of the signifi discovery of hydrocarbons there, sources said.

CO-PROMOTERS OF DOWN-STREAM UNITS IN HALDIA PE JECT YET TO BE DECIDED

The exercise on shortlisting of in strialists to be inducted as additio co-promoters for the downstream u of the Haldia Petrochemicals Projec still continuing and the state gove ment is yet to firm up its views, Jyoti Basu said. In, perhaps, the f statement to reporters on the proj while holding discussions with the in strialists during the last two weeks, chief minister said he was not too bo ered about the controversies associa with certain industrialists who have for the project. Meanwhile, seve industrialists met Mr. Basu, some review the Haldia project and others discuss prospects of new projects in t state.

Industries told to invest more in in-house R & D

The Minister of State for Science and Technology, Prof. M.G.K. Menon, appealed to the industries to increase their investment in in-house research and development.

Inaugurating the third national conference on in-house research and development in industry in New Delhi recently, he said industry's share in the total research and development in the country was only 20% whereas it was around 70% in many other countries. There should be a motivating force for improving this position and in-house research and development should not be considered as a show-piece, he said.

Ideas of co-operative research and linkages between the industry and research and development structures should be considered seriously and implemented vigorously, Prof. Menon said. Modern science provided vast opportunities to the industry and they should make use of the existing national infrastructure, he added. Prof. Menon said the time was appropriate for the industry to highlight their inputs as a new Government has assumed charge. Industry was an extremely important component of development and it should carefully analyse its directions, he said.

Generation of more employment opportunities was very important and the industry should play a key role in this process. However, the exploitation of resources should be careful and it should keep in mind protection of the environment and energy conservation, he added.

Dr. A.P. Mitra, Director-General of the Council of Scientific and Industrial Research (CSIR), said the industry should make use of the infrastructure of high quality available with the CSIR laboratories. He said CSIR was taking steps to help the small-scale sector which did not have an in-house research and development facility.

Prof. Menon presented national awards for research and development to nine industrial establishments. The award winners were Bharat Heavy Electricals, Bhopal, Gujarat Communications and Electronics Ltd., Baroda, Ranbaxy Laboratories, New Delhi, Garware Plastics and Polyester, Bombay, Wipro Information Technology, Bangalore, Larsen and Toubro, Bombay, Steel Authority of India's Ranchi unit, Maharashtra Hybrid Seeds Company, Bombay and Lupin Laboratories, Bombay. The conference is jointly organised by the Department of Scientific and Industrial Research (DSIR) and the Confederation of Engineering Industry (CEI).

Plastic industry poised for unprecedented growth

Plastics are increasingly becoming synonymous with modern living. It has penetrated extensively into the common man's life. Plastic industry in the country is now being increasingly associated with the thrust areas of economic growth. It is pointed out that the demand for plastic goods has touched an all-time high of seven lakh tonnes rising from the low of 13,000 tonnes in 1960-61 and 87,000 tonnes in 1970-71 and four lakh tonnes in 1985.

The rapid growth in the consumption of plastics is attributed to its versatility as well as relative advantages in weight, processability, heat conductivity and non-toxic nature. Plastics is penetrating, and invading in all directions, be it automobiles, agriculture, pharmaceuticals, fertilisers and processed foods. Experts say, if the current trend of an average growth rate of 15 per cent is any indication, the consumption of plastics in India by the turn of the century is estimated at 25 lakh tonnes, which would imply a per capita per annum consumption of 2.16 kg.

As against this, the current level of per capita consumption is deplorably low at only 0.64 kg compared with world average of 14 kg. Hence, experts say, an enormous growth potential exists for expanding the use of plastics in the coming years. Plastics industry has come of age and has now attained national importance owing to its sheer growth and multifaceted applications. The industry had its humble beginning in the early fifties and presently the plastic raw materials sector is dominated by giant manufacturers like Indian Petrochemical Corporation Limited (IPCL), Polyolefins Industries Ltd. (PIL), and NOCIL etc. Still all the existing units are unable to meet the domestic demand and the country is forced to import at least half of its raw material requirements. On the other hand, processing sector is dominated by small-scale units, whose share is 85 per cent in number and 50 per cent in value of the products manufactured.

With an estimated investment of Rs. 2,500 crores in about 14,000 units, the plastic processing sector today provides direct employment to about six lakh people in the country. Moreover, the raw material sector plays an equally important role in the national economy by providing the necessary raw materials to the processing industry as well as generating income and employment to a large number of people.

Plastics has excellent export potentialities. However, the year 1987-88 witnessed the export of plastic goods worth Rs. 64 crores, against the target of Rs. 92 crores. It is pointed out that when compared to the potentialities of this sector, this is a negligible amount. The export of plastic products, which was Rs. 62 crores in 1980-81, has not shown the desirable growth rate. Rather the growth was highly erratic and most of the time below targets. For the year 1988-89, the target fixed by the industry is more than Rs. 100 crores. Experts point out that an industry, whose imports of raw materials cost the country an exchange outgo of Rs. 750 crores at present, should naturally try to export rather a higher amount than at present so as to compensate this loss.

Analysts say that if the past trend is any indication, great deal of effort is required to push up the current level of exports, which have been more or less stagnating for quite sometime. Morever, experts say, the import of plastic raw materials has become prohibitively expensive as the international prices have gone up by 160 per cent during the last 15 months. In such a situation, the current import of 3.41 lakh tonnes of raw materials has become a burden to the nation. It is also pointed out that since all kinds of processing machineries and skilled labour (at cheap ra domestically available, an extra to boost exports of finished plasti ducts will yield results.

There is also a brighter side respect to plastics, which is evide India. The demand for plastics has going up, despite the comparat higher prices. According to expert consumption scene is not likel exhibit a different trend in the yea come. Because of versatile use of tics, the Centre has selected 15 dist for intensive development of plast ture (the use of plastics in agricul under a Rs. 50 crore five-year gramme. According to Chairm National Committee on Plasticult Dr. G.V.K. Rao, the rationale bel the project is to enable agricultur take advantage of the plastics revo tion, which had made its impact in industrial and consumer goods fiel

Apart from encouraging more c sumption of plastics, the plasticult can play an invaluable role in the op mum utilisation of scarce and vi resources such as water. For instance lining of water canals with polythe film could reduce the loss due to see age by as much as 40 to 50 per ce evaporation losses could be cut down using a drip irrigation system, whi could manage with 30 to 40 per cent the water used in conventional irrigati and sprinkler, and irrigation could sa 50 per cent of the water. Other area where plasticulture can be used a mulching (spreading of film on the so to prevent weeds) and greenhouses (th film houses for growing crops unde controlled temperature — quit common in countries like Israel an Japan).

On similar lines to encourage con sumption of plastic, the Union Govern ment has taken a policy decision t substitute wooden furniture with plas tic furniture wherever possible. Accord ing to a conservative estimate, variou government organisations and offices

one spend about Rs. 300 crores on uying wooden furniture.

According to official sources, initially ie government will consider the use of ew articles like plastic chairs and enches in government offices, railway tations, hospitals and schools. This vould be followed up with greater use f these items in public sector under-akings and government offices. As a irst step the government had asked the Bureau of Indian Standards (BIS) to vork out the quality stipulations equired for plastic furniture. The idea s to standardise the plastic furniture products already available in the coun-ry.

The government move follows the recommendations of the working group set up by Department of Chemicals and Petrochemicals (DCP) to study the possibility of replacing the wooden furniture with plastic furniture. The group was set up by the government in view of the increasing deforestation and its ecological impact on the country. It is being felt that if wood could be replaced by plastic, in one of the major areas of use, namely furniture, it would automatically have an impact on the felling of trees.

The working group comprised representatives of the Department of Science and Technology (DST), Directorate of Technical Development (DGTD), Central Road Research Institute (CRRI), Indian Petrochemicals Corporation Limited (IPCL), National Building Organisations (NBO) and the Plastic Processors Association (PPA). The group's objective is to consider the possibility of using plastic furniture in home and offices.

The working group has the following terms of reference: possibility of using plastic furniture in homes, offices and other areas; raw materials required to be used for plastic furniture; impact of using plastic furniture with regard to safety and inflammability; the cost of plastic furniture; feasibility of making plastic furniture in small and medium sectors; arrangements for marketing plastic furniture and the need to provide fiscal and financial incentives.

The working group has presented a perspective of growth in plastic furniture keeping in view its potential as a substitute for wood. In India, the group notes, plastic products have gained adequate consumer acceptance and the range is large enough to cater to the demands of different sectors. The group has observed that plastic furniture is costlier by about 20 per cent. If the differential impact of taxes and other levies are removed, plastic furniture would be comparable in price to wooden items. In fact, the working group has pointed out, in terms of total lifetime costs, plastic furniture is "more economical. The potential for plastic furniture is much more than its existing size."

In view of versatility of plastic, experts say, the plastic industry has to play a very vital role in the Indian economy. It is regarded as a sunrise industry as the future emphasis is bound to be on this industry. The government has already identified this industry as a thrust industry and has recognised the fact that plastics can substitute energy intensive materials such as glass, aluminium etc. and help in conserving natural resources such as water and wood. The plastic industry is now poised for an unprecedented growth in various sectors like telecommunications, potable water transport, rural health programme, educational aids, consumer and export packaging. In view of this, allout efforts should be made to encourage integrated development of this newly emerging industry.

UTILITY FROM GARBAGE

An Australian company has developed a process which turns household garbage into lightweight aggregate suitable for use in building. The technology involves a four-stage firing process which converts fuel pellets, made up solid waste mixed with clay, into a vitrified, lightweight aggregate.

Plastindia '90

Plastindia '90, India's first international plastics exhibition and conference, will take place at Pragati Maidan, New Delhi in March 1990. It is being organised by the Plastindia Foundation in association with NOWEA International of Dusseldorf.

As India is currently on the threshold of the plastics age, it is expected to double consumption every five years. That is why the well-timed Plastindia '90 exhibition and conference has elicited such an overwhelming response. Over 350 exhibitors have already booked the entire floor space of about 20,000 sq. km. in Pragati Maidan, making it one of the biggest exhibitions of its kind in this part of the world.

Besides 185 regular exhibitors and 111 exhibitors from the small scale industry (SSI), nearly 60 foreign exhibitors from 15 countries will also participate. These include exhibitors from Austria, Belgium, China, France, FRG, Hong Kong, Italy, Saudi Arabia, Spain, Switzerland, Taiwan, the U.K., U.S.A., U.A.E. and Yugoslavia. Exhibitors from several other countries are also expected to participate.

Plastindia '90 will represent all segments of the plastics industry — raw materials, additives, processing equipment ancillaries, instruments/testing equipment, semifinished and finished products, industry associations, research/development/consultancy organisations and export promotion bodies.

An international plastics conference with the theme "Technologies for '90's" will be one of the highlights of Plastindia '90. Scheduled to be held in Pragati Maidan between March 3-6, 1990, this conference will have eminent personalities from all over the world presenting papers on state-of-the-art and emerging trends in the plastics in Distinguished Indian and foreig nical experts will participate as gates.

The Plastindia Foundation is pu ing a comprehensive directory to as a guide and reference for exhi visitors and delegates. It will pr detailed information about the e tors — their products, equipmen services. Members of the plastics i try can advertise their products an vices in this Directory.

Plastindia '90 will exhibit a range of the latest polymers, bl alloys, composites and addi Modern processing equipment ancillaries from India and abroad also be exhibited.

Besides processors and large industries, Small Scale Industry units from even remote areas like north-east will display innovative tic products for industrial, agricul and household applications.

Visitors to Plastindia '90 will g chance to interact with technical, keting and commercial experts f India and all over the world. This offer an ideal opportunity for mem of the plastics and plastics-related in try to broaden horizons and exp export possibilities.

OIL SLICK NEAR MOROCCO THREATENS WORST DISAST

A huge oil slick from a stricken I ian supertanker drifted closer to Mo co's Atlantic shore on January threatening one of the world's wo ever ecological disasters.

Overnight, South-Westerly winds currents pushed the 175-mile long s to within 22 miles of the coast w international experts warning of a astrophe to rival the Exxon Val crude spill in Alaska.

SPOTLIGHT ON

Biotechnology & Life Sciences (Part 1)

PLANT GENETIC SYSTEMS UNVEILS A NEW BREAK-THROUGH IN HYBRID SEED PRODUCTION

Plant Genetic Systems (PGS) of Ghent, Belgium last October announced a new breakthrough in hybrid seed production. This breakthrough could lead to the creation of new and more efficient hybrids.

Working in collaboration with Prof. Robert Goldberg of the University of California, the PGS has constructed and expressed a gene that prevents pollen development in crop plants, especially rapeseed oil. The result is a male sterile plant, an essential component in the creation of hybrid seed. Traditional methods for instilling male sterility in plants can be costly and inefficient, claims PGS.

The scientists report they have succeeded in isolating a promoter that allows the expression, of a gene exclusively during the development of a plant's anthers (the male reproduction organ). According to the research director Jan Leimans of PGS, this anther specific promoter has been used to express in the plant a gene conferring male sterility. Through the promoter, a protein encoded by the gene is expressed only during the critical few days when pollen would normally develop in the plant, suppressing its production. The protein then disappears after rendering the plant's male sterile, allowing it to continue normal development.

Apart from the economic significance to rapeseed oil, which account for some two million hectares of plantation in Europe, PGS claims the introduction of a gene in only a small part of a plant for only a few days is 'unique in genetic engineering'.

Further, the company claims that the new system is 'universal', except for cereals. Work is continuing on a wide range of crops from vegetables such as brussels sprouts, to soya bean and cotton. PGS hopes the new hybrids could be on the market by 1992.

Commenting on the development, Michael Renard, research director of France's Institut National de la Recherche Agronomique, said it not only represented a major technological breakthrough, but gives 'breeders great flexibility to create new hybrid varieties'. (*ECN*, 10/30/89, p. 24).

NEW BREAKTHROUGHS IN PLANT BIOTECHNOLOGY

Plant biotechnology looks increasingly promising as a new low-cost route to high-value products. Researchers at Morgan International (Netherlands) have succeeded in producing the pharmaceutical protein 'human serum albumin' (HSA) in potatoes. They claim it is the first time such a complex protein has been genetically engineered in a plant. The Morgan researchers have succeeded in expressing the human gene in the potato plant by replacing the human signal sequence with a plant-derived signal.

The purified albumin appears indistinguishable from HSA sourced from human blood plasma. The company has filed a patent application on the production method and is now teaming up with the Dutch potato starch processing concern, Avebe, to scale up to semi-technical production.

According to Dutch researchers, plant biotechnology has entered a phase when researchers can routinely express genes in plants. The technology can be applied to a whole range of pharmaceutical proteins, such as insulin and human growth hormone, and also those used in the food and detergent industries.

Further ahead in USA, scientists at the Research Institute of Scrupps Clinie, La Jolla, California, have introduced versions of mouse gamma and kappa immunoglobulin genes into tobacco cells. These have been cultivated into healthy plants, opening the possibility of an agricultural route to basic biotechnical building blocks.

Kappa and gamma immunoglobulins combine naturally to form antibody molecules. The Scripps researchers processes can cross plants containing the gamma gene with those containing the kappa gene to produce a plant that expresses both. The antibody represents 1.3% of the tobacco leaf protein.

Andrew Hiatt of Scripps recently explained that a commercialised process making antibodies as an agricultural product would find uses hitherto unavailable because of the high cost. Hiatt believes the cost of producing antibodies could fall from millions of dollars per kg to less than $100/kg. He further speculates that antibodies could be used in future for purification in industrial processes or as environmental detoxificants. (*ECN*, 11/6/89, p. 29).

A BIOTECH PROCESS FOR ERYTHRITOL ON THE HORIZON

Erythritol is almost as sweet as sucrose but with no calories and also has good heat stability and low hygroscopicity. Researchers at Nikken Chemical uncovered recently a microorganism capable of making erythritol $HOCH_2CH(OH)_2$. After mutation of Aureobasidium species, foaming characteristics were eliminated and a practical fermentation process was

developed by using saturated glucose solutions (83.3%), which gave a 43-52% yield in batch or continuous mode and very low by-product levels. Erythritol has better flavour and bulking properties than aspartame and stevioside. The company also projects other uses in paints and resins for erythritol. (*Chem Brit.*, 1988 24 (12), 1186).

CUTTING GLADIOLI DOWN TO SIZE VIA TISSUE CULTURE

Israeli researchers have produced dwarf gladioli via tissue culture. Fields in Israel's Negev Desert are ablaze with dwarf gladioli. Scientists at Israel's Agricultural Research Organisation led by Dr. Anver Cohen, have recently developed a new strain of 'mini-gladioli' that is proving popular with flower lovers all over Israel. Though gladioli are decorative flowers, they are often unpopular because they are large and awkward to arrange in vases. Modern tissue culture cloning in Israel has produced a new gladioli, which is approximately half the length and thickness of the traditional flowers. (*News from Israel*, Oct. 1988, p. 14).

EMBRYOS ARE 'CHILDREN'

A judge in Tennessee in USA ruled last September that seven frozen embryos belong to their biological mother not the father. The court case is the first custody battle in USA involving eggs fertiliser outside the womb.

The case arose after the sperm donor Juniour Davis divorced Mary Davis, who had provided the eggs for in-vitro fertilisation. They were fertilised before the marriage was dissolved. The 'father' did not want the eggs to be implanted, while the mother did. The eggs have been stored at a fertility clinic, while the couple resolved the dispute in court.

The judge ruled that life begins at conception and that the embryo were not property but children that the mother should have the custody. Medical experts told the court that the embryo at the time of freezing consisted of four to eight cells each. (*New Sc.*, 9/30/89, p. 23).

BIOLUMINESCENCE EMERGES AS A MONITOR OF GENETIC ACTIVITY

Bioluminescence is emerging as a novel means to monitor genetic activity. Two years ago, researchers at the University of California (San Diego) introduced the gene for luciferase, the enzyme responsible for a firefly's glow, into tobacco plants. The same researchers have now taken genes for four other bioluminescent enzymes, each catalysing a different coloured luminescence and successfully transplanted them into bacteria. Depending upon the gene, the bacteria can glow green, yellow, orange or yellow-green.

A luminescence enzyme becomes a marker for genetic activity when its gene is coupled to another gene of interest. Expression of the latter gene also triggers the production of enzyme. Addition of luciferin, which reacts with oxygen in the presence of ATP and luciferase type enzyme, generates the chemical light. Because the new enzymes differ in their emission spectra, it would be possible to monitor several genes in this manner. Bioluminescence also can be used to track cells or genetically modified organisms.

The four marker genes were taken from the Jamaican click beetle, a firefly that relatively emits light from an organ on the abdomen and a pair of organs on top of the head. Biologist William McElaroy and the late biochemist Marlene Deluca began studying the beetle 30 years ago. 'We measured the light with a spectrometer for the first time and found that the beetle emitted five or six different wavelengths light', said McElroy.

With the advent of the new genetic techniques, McElroy and chemists K Wood and Y. Lam along with biolo Howard Selinger from Johns Hopk University, succeeded on isolating sequencing the genes. They found four genes to be 95% to 99% hom ogues with each other, but reflect evolutionary distance, only around 5 homologous with firefly lucifera (*Anal Chem*, 7/15/89 p. 833-834).

A NEW BIMONTHLY PUBLICA TION 'BIOTECH PRODUCTS INTERNATIONAL'

The year 1989 saw the publication bimonthly called Biotech Produc International. It is published by P European Publishing Co. (a division Elsevier Librico N.J.), Iue Verte 21 1210 Brussels, Belgium. It is publishe six times a year, Jan/Feb, March/Apr May/June, July/Aug, Sep/Oct, Nov/De

Designed on a broad-based produ information source for bioscientists an bioengineers, this new journal wi review the latest product developmen relevant to the various fields of li science research and bioindustry.

CHEMISTRY NOBEL PRIZE FO RESEARCH ON RIBONUCLEIC ACID (RNA)

One of the established rules o molecular biology — until this 198 Nobel Prize winners Sidney Altman an Thomas Cech came along — was tha cellular catalysts were always proteins made of amino acids. But the above sci entists showed that nucleic acids, as wel as proteins, can act as catalysts.

Ribonucleic acid (RNA) ferries instructions from genes to ribosomes to make proteins. To create the RNA in the first place, the double helix of deoxy-ribonucleic acid (DNA) that makes up the genes unwind. One DNA strand acts as a template to assemble and link up a string of ribonucleotides, forming RNA.

Some stretches of the DNA are use- s for making proteins, thus, some of newly formed RNA is also, and se segments must be edited out ore the RNA can go on to create pro- ns. Like many other chemical pro- ses in a cell, that editing also requires atalyst. The prize winning research owed RNA itself can act as the cat- st.

Yale University, where Altman is a ology professor, notes the two scien- ts' work suggests that primitive cells ight have used RNA instead of pro- ins to regulate themselves.

Altman does not foresee any immed- te applications for the discovery, but e Royal Swedish Academy of Scien- s, which awards the Nobels, believe talytic RNA could be designed to act s 'gene shears to destroy RNA mol- cules that produce harmful or undesir- ble properties in organisms. (*Chem Wk.*, 10/25/89, p. 14).

N-SITU PROCESS DEVELOPED O BIODEGRADE TRICHLORO- THYLENE

Trichloroethylene present in ground- vater can be biodegraded by an in-situ rocess, according to field trials — just ompleted by Ecova Corp. (Redmond, Washington). In the five day test by the vaste management company, the pro- ess achieved the reduction of trichlo- oethylene in-situ from a high 3000 ppb o less than 100 ppb.

The programme involved proprietary rocess for introducing nutrients, oxygen and naturally occuring bacteria nto the sub-surface. It is based on iso- ation by Ecova's researcher Michael Nelson of the trichloroethylene bacteria and identification of a non-toxic inducer to stimulate the microbial activity.

Citing the test results as an advance- ment over conventional processes, such as air-stripping are carbon adsorption, Ecova's project manager John Kinsella reports, 'the rapid degradation rates will allow us to move forward to rapid site cleanup that will result in reduced remediation costs for the client'. (*C & EN*, 10/2/89, p. 18).

RECENT STUDY IN USA FORE- SEES NEW APPLICATIONS OF ENZYMES IN SEVERAL FIELDS

The US market for applications for enzymes, now at $266 million/year will grow 7% per year for the next five years, according to a study by manage- ment consulting firm Strategic Technol- ogies International (STI, Mundelein IL). The study 'Enzymatic Syntheses; Tech- nical Advances & Commercial Pro- spects' notes that current applications for enzymes include food processing, detergents and the manufacture of semi-synthetic antibiotics, but STI sees promise in synthesising products such as beta-blockers, non-steroidal anti- inflammatory drugs, bioadhesives and herbicides.

Lastly, in the oils and fats industry, use of lipases to split triglycerides and make synthetic cocoa butter should 'find wide use in the next few years', STI says, to the tune of $40 million in the USA. (*Chem Wk.*, 11/1/89, p. 25).

L-CYSTINE AND L-TYROSINE TO BE PRODUCED FROM HUMAN HAIR IN INDIA

L-tyrosine and L-cystine amino acids are to be produced from human hair in India. The technology from Japan for the production of these amino acids has been procured by an Indian company Protchem Industries (India) Ltd. A Rs. 123 million, 100 per cent export oriented project to produce the above two amino acids is coming up in a vil- lage Abishekapakkam near Pondicherry.

It is proposed to manufacture 1400 tonnes/year of amino acid powder, 84 tonnes/year of L-cystine and 24 tonnes/- year of L-tyrosine. The products will be exported to Japan as part of the buy back guarantee for eight years.

The proprietary process produces amino acids by treating human hair with HCl and then treated with caustic alkali and soda ash. After various steps cov- ering filtration and pH adjustments, electrical drying, the process obtains pure L-cystine and L-tyrosine.

A unique feature of the technology is that the disposable effluent is not wasted but treated to a complex process to pro- duce amino acid powder containing as many as 19 amino acids. (*PTI Science Service*, 8 (7), 1989, 1).

CURRENT THEORIES ON CHE- MICAL PROCESSES CAUSING DESTRUCTION OF THE EARTH'S OZONE LAYER UNDER SCRUT- INY

Government researchers in USA report recent experiments cast doubt on widely accepted theories about the chemical processes causing destruction of the earth's ozone layer. The scien- tists say currently recognised chemical reactions involving chlorine and bro- mine cannot explain all the ozone loss that occurs over the Antarctic during the region's springtime. The chlorine bro- mine reaction accounts for less than one-half of the loss they explained. (*CMR*, 9/18/89, p. 7).

Food & Pharmaceutical Technology in Perspective (Part 1)

BACTERIOPHAGE VIRUS DEVELOPED TO PROTECT CHEESE

A new British method of protecting cheese against infection by Listeria bacteria uses the listeriaphage virus.

The phase works by attaching to the wall of the Listeria bacteria and injecting genetic material which takes over the reproductive mechanisms of the bacteria. Between 300-400 listeriaphage are produced in the bacteria which ultimately breaks open.

Developed by the Microbial Developments Company, Worcestershire, UK, the company's technical director, Carol Day reports that although there are already several ways of countering bacterial growth in cheeses, once the cheeses are made, they are vulnerable to listeria infection, if not stored correctly. However, if phages are added during cheese making, they will remain active for the life of the cheese and can attack if bacteria infects the product.

The company hopes to have listeriaphage virus commercially available in early 1990s after trials. (*Food Manuf.*, 6/1989, p. 16).

A NEW TYPE OF SEADLESS MELON ON THE HORIZON

Melons may join apples and oranges in packed lunches. A plant breeder in Charleston, South Carolina has developed new varieties of melon that are the size of plums and can be eaten skin and all.

Perry Mugent, a researcher at the US Department of Agriculture's Vegetable Laboratory has been active in research since 1987 to find new melons for the important market for 'snack' fruit, where apples, citrus fruits, peaches and plums dominate. His goal is a hybrid bred from wild melons that have been crossed with cantoloupe or honeydew melons.

The ideal melon will be bright yellow, it will have orange or green flesh and a thin edible skin. The melon will also be seedless and have a long shelf-life. However, it will be atleast two years of research before such melons can be produced in the fields.

One of his plants now yields between 6 and 15 grapefruit sized melons per vine, with flesh that is firm and sweet but off-white in colour. So far researchers have crossed commercial varieties of cantaloupes and other melons with wild plants, whose fruit is about the size of an egg. Unfortunately, these tiny wild melons are not very sweet and their aroma is odd.

The greatest challenge to researchers will be to make the melons seedless. As the researchers reduced the size of the melons, the size of the seeds did not go down as fast as the rest of the fruit. Therefore, researchers will have to try a new approach for obtaining seedless melons. (*New Science*, 8/19/89, p. 32).

TAKING THE CHOLESTEROL OUT OF DAIRY GOODS

Lowering cholesterol levels in foods is now possible. Researchers at Cornell University and the Food Research Society in Japan working independently, have developed practical methods for supercritical fluid extraction of cholesterol from milk.

What makes the Cornell process particularly exciting is that it not only reduces cholesterol by 90% but also recovers up to 88% of decholesterolized butter fat. Returning the decholesterolized butter fat to skimmed milk opens the door for a host of low cholesterol dairy products including butter, cheese, ice cream and of course, milk.

To obtain the decholesterolized fat, the Cornell group injects CO_2 at 40°C and pressure as high as 4000 psi, into butterfat. The supercritical CO_2 removes cholesterol along with some triglycerides and carries it into a second unit, when changes in pressure and temperature help to selectivity precipitate the cholesterol.

In a third unit, the pressure drops to atmospheric level, and the now gaseous CO_2 dissipates, leaving the triglycerides behind to be restored to the butterfat.

The Japanese approach is similar and an 84% reduction in cholesterol and 80°C recovery of butterfat have been reported. Both procedures borrow from the commercial methods for supercritical fluid extraction of caffeine from coffee and in beer's characteristic bitter flavour from hops.

Dairy producers hope that lowering cholesterol will boost milk sales in USA, Western Europe and Japan. (*Anal Chem*, 5/1/89, p. 588 A).

A NEW TECHNOLOGY TURNS POTATO WASTE INTO BIODEGRADABLE PLASTICS VIA ACID

A new process that biologically converts food processing waste into lactic acid and then uses the lactic acid to make environmentally safe, bio- and photo-degradable plastics was developed at Argonne National Laboratory (Argonne, Ill, USA).

In the new route starch (from such sources as potato-waste or cheese whey) is enzymatically hydrolyzed to glucose.

The glucose and other hydrolysis products are subsequently fermented by bacteria (L. lactis) that produce lactic acid which is continuously recovered, concentrated and further purified into a polymer grade product.

Few, if any of the degradable plastics currently available, including plastics containing starch, degrade to innocuous compounds, have suitable physical and mechanical properties and are cost effective.

On the other hand polymers and copolymers made from lactic acid have excellent mechanical properties and degradability and the availability of low cost feedstock and cost effective bioconversion and recovery processes should stimulate the use of lactic acid in making bio - and photo -degradable plastics. (*Chem Eng.*, 9/1989, p. 19).

FRUIT AND VEGETABLE PRESERVATION BY COATING OF NATURAL YEAST DEVELOPED BY ISRAELI RESEARCHERS

Israel has developed an expanding fruit and vegetable export business to Europe. It supplies fruits and vegetables during winter months to Europe in a big way. This export business required modern fruit and vegetable preservation acceptable to choosy educated European buyers. Now, scientists at Israel's Agricultural Research Organization (ARO) near Tel Aviv have isolated a form of natural yeast that occurs in nature on the skin of citrus fruit, protecting it against fungi. The yeast has already been produced in large quantities, patented and successfully applied to a consignment of tomatoes and cucumbers exported to Europe.

Israeli experiments show that 96% of produce stays fresh after treatment with this yeast, reports Dr. Edo Chalutz of the ARO Institute for Technology and Storage of Agricultural Products. The yeast does not affect taste and as it occurs in large quantities in certain cheeses.

Dr. Chalutz envisages a situation whereby a dipping coating process is built into all fruit and vegetables pacing stations. Israel also hopes to sell laboratory made yeast to farmers in Africa and America who export their fresh winter produce to Europe. (*News From Israel*, 10/1989, p. 15).

A NEW PROCESS CLAIMS TO PROVIDE FRESH CRISP CANNED VEGETABLES IN FUTURE

A food chemist in USA has patented a method of canning in which vegetables stay as firm and crisp as the garden fresh vegetables. Malcolm Bourne, a professor of food science and technology at Cornell University, New York, has recently identified an enzyme which reverses the process that makes the canned vegetables soft and mushy. He also discovered that reducing the temperature during the blanching stage of the canning procedure, stimulates the activity of this enzyme. He is confident that once the researchers find a way to eliminate the microorganisms that survive the lower temperature, tinned vegetables will be fresher than frozen ones.

In normal canning, vegetables are blanched for a short time in boiling water simply to drive out gases so that they can pack more vegetables in the can. The vegetables are then heated in the container to sterilise them -- from microorganisms that cause botulism.

Suspecting that the vegetables lose their crispness during the blanching, researchers investigated the chemistry that makes them mushy. They found that heat breaks down the large pectin polymers which are responsible for firmness and crispness in fresh vegetables. They also discovered that pectin methyl esterase, an enzyme which exists in all plant tissues, could reverse the softening effects of cooking. This enyzme is able to build salt bridges out of any available calcium atoms. If conditions are made favourable, the enzyme can produce more linkages and a la pectin polymer and crisper foods.

After experimenting with thousa of cans, the researchers found blanching the vegetables at temperatu between 60 and 65°C, then waiting 30 mins. for the enzymatic action, p duced dramatic results. Carrots prepa with the new technique withstood force of 437 newtons before bei crushed. This compares with the for of only 219 newtons that is needed crush carrots that have been canned the conventional way.

Researchers under Bourne also di covered that adding calcium along wi citric acid to lower the pH of the foo raised the force needed to crush the ca rots to 1581 newtons. That is almost a firm and crisp as fresh, uncooked pro duce.

Bourne also found, however, tha some microorganisms thrive at the tem peratures, he employed for blanching He is confident that microbiologists wil find a way to control this in a year o two. (*New Science*, 9/23/89, p. 35).

GENETICALLY ALTERED CUCUMBERS TO BE FIELD TESTED

USDA has given approval to Cornell researchers to field-test cucumbers genetically altered to tolerate the cucumber mosaic virus. It will be the first USDA permitted field-test of a transgenic organism in New York and the first for such a test with cucumbers.

Dennis Gonsalves, a plant pathologist at the New York State Agricultural Experiment Station in Geneva, developed the resistant vegetable by splicing a gene from the virus into the plant's DNA. USDA reports the experiment which has already been conducted in a greenhouse setting, began in August and will continue until frost begins. The mosaic virus causes distorted leaves on

plants and reduces both yield and quality. (*C & EN*, 8/28/89, p. 21).

PENSIZED DEVICE TO DELIVER INSULIN & MEASURE BLOOD GLUCOSE LEVEL

A new device can free many insulin dependent diabetics from their need to carry around numerous syringes needles and insulin vials. The insulin delivery system resembles a fountain pen and uses replaceable cartridges and needless. Doses are accurately controlled with a dial on the pen that enables patients to select from 2 to 36 units. Diabetics dial the dose and inject themselves as they would with a normal syringe.

The 145 gm pen can be carried discretely in a bag or briefcase. One can be dining out and give oneself an injection without anyone knowing it, reports Dr. Robert Rood, Senior Medical Director of the Diabetic Treatment Centre of California, where the pen was developed.

Many physicians believe simplifying injections can improve insulin-dependent patients' willingness to manage the disease, leading to better control of the disease. Diabetes, when uncontrolled, can lead to blindness, and kidney and heart disease.

The pen costs about $40 in USA and is available in the market in USA. Another pen-sized device measures blood-glucose levels. It is easy to use and gives results within 30 seconds. (*Los Angeles Daily News*).

VITAMIN A LINKED TO LIVER DAMAGE IN THE ELDERLY

Recent research of Dr. S. D. Drasinki and his co-workers point out that although Vitamin A deficiency is uncommon in effluent countries like USA and Western Europe, many nevertheless, take supplement of this vitamin, usually in a multivitamin preparation. A survey undertaken by the above researchers indicated some liver damage particularly in the elderly. They therefore, recommend that elderly people should limit their intake of supplemental Vitamin A, particularly over long term, to avoid overload and possible liver damage. Perhaps, the margin of safety for Vitamin A intake is lover in the elderly. (*Amer J. Chemical Nutrition*, 1989, 49 (1)).

THE HEALING TOUCH OF SILVER

Metallic silver chemically bonded to the material used to make surgical sutures seems to inhibit infection and speed the healing of wounds, according to recent research at Cornell University (Ithaca, N.Y.). When a few microamps of electricity are passed through sutures, silver ions are released and act as an antibiotic, researchers report. The pro-

ject now awaits a grant from the National Institute of Health (USA) for testing in mice. (*Chem Wk.*, 10/9/89, p. 26)

RESEARCH ON PHYSIOLOGY OF HIBERNATING BEAR FUNDED TO DEVELOP FUTURE TREATMENT OF KIDNEY FAILURE AND BONE LOSS

Biochemists suspect that hidden in the black bear's physiology during hibernation may provide clues for curing kidney failure and bone loss in humans.

Black bears hibernate in winter for as long as 5 months. During that period they do not eat, drink, urinate or defecate. Its heart rate during hibernation is about 8 compared with a normal sleeping rate of 40. The body temperature is about 9°F below the normal 100°F. Further, studies have shown that hibernating bears do not lose calcium from their skeleton when hibernating. In contrast bones of mammals who are not constantly fighting gravity tend to weaken from calcium loss and osteoporosis. Examples are bed-ridden patients and astronauts.

Researchers therefore, believe that some as yet unknown regulatory substance must be preserving inactive bears from this problem during hibernation. Perhaps in future researchers will be able to isolate this active substance from bears.

Researchers at the Carle Foundation Bear Research Centre, (near Champaign, Illinois USA) have found that a hibernating bear burns mainly fat, thus minimizing the build up of the toxic urea produced when protein is metabolized. This urea produced is broken down and the nitrogen recycled to protein synthesis. Because the bear does not urinate, it needs only enough water to replace that loss during breathing, that amount is supplied by the breakdown of fat. The researchers idea is to ape the hibernating bear's metabolic efficiency and so reduce the amount of waste duced and the need for kidney t plants or haemodialysis. Based on hypothesis, the researchers are plan a test for a diet with 70 patients at M Clinic's dialysis centre. They hope a proper diet (based on fat) will dialysis sessions to once a week, ins of the more common three ti weekly.

The researchers are also searching the unknown compound that trigg hibernation in bears, and other hiber tors such as wood-chicks, bats ground squirrels. (*Discover*, 4/1987) *& EN*, 5/29/89, p. 76).

EEC BANS MILK HORMONE (BST)

The European Commission last Se tember imposed an 18-month ban on use of bovine somatotrophin (BST) raise milk production in Europe. R MacSharry, Europe's Commissioner f agriculture reports that research must completed before BST can be license BST is a protein hormone. The com panies that manufactured it, includin Eli Lilly and Monsanto want to mak it the first product of recombinant DN technology to be marketed on a larg scale to farmers.

The companies claim that it raise yields of milk by 10 to 25% and that harms neither cows nor consumers o the milk they produce. Farmers and con sumers in USA and Europe oppose th use of BST. Farmers fear that it wil give large farms with more sophisticate means of caring for treating cows competitive advantage over smalle producers.

Last September moratorium on the use of BST was a compromise betwee such combined opposition and pressure from the USA. The moratorium was shortened from an original proposal for it to the last two years. Some feel that banning BST will threaten scientific progress. (*New Science*, 9/23/89, p. 23).

Science Briefs

CD AGREES SAFETY STUDY

n what has been described as a mile-
ne in international collaboration,
CD member countries agreed on
vember 9, 1989 to embark on a sys-
natic investigation of the potential
lth and environmental effects of
sting chemicals.

The move stems from the third high
el meeting of the OECD chemicals
oup in 1987 which called for new
ernational cooperation to increase
owledge of the potential hazards of
emicals produced in the largest quan-
es worldwide. A priority 150 chem-
ls of the 1,500 produced in high
lume within the OECD have been
ntified for initial study. Each of the
0 is produced in quantities exceeding
000 ton/year in at least one OECD
untry.

As an immediate priority, OECD
untries have agreed to share the
sponsibility, with individual member
untries volunteering to sponsor work
particular chemicals. Finance proce-
ures will be up to individual countries.
Japan, funding will come from the
overnment, elsewhere industry will
oulder the burden.

Protocols for the basic data to be gen-
ated have still to be agreed upon, but
e cost per chemical could be as high
\$200,000.

The work is to be carried out in col-
boration with the EC, the United
ations International Programme for
hemical Safety and the International
egistry of Potentially Toxic Chemi-
ls.

Sufficient work should be completed
y the end of 1993 to screen the poten-
al hazards of the 150 priority chemi-
ls. The information will be made
vailable to users of chemicals world-
ide.

SACHTLEBEN OPENS WASTE ACID UNIT

Titanium dioxide producer Sachtleben Chemie has started up a DM200m (\$108m)plant to recycle spent acid at its Duisburg site. The start-up marks the end of dumping spent acid from West Germany into the North Sea.

The 800,000 ton/year plant will treat waste from Sachtleben's titanium dioxide production facility at Duisburg and also from pigment manufacturer Kronos Titan of Leverkusen. Waste acid will be concentrated and returned to the production cycle.

The plant was designed and constructed by Lurgi using Bayer technology.

Commissioning of a recycling unit will allow Sachtleben to expand production capacity. From late 1990 the company will be able to supply 85,000 ton/year of titanium dioxide, an increase of around 35 per cent.

An EC ruling in June called for a ban on the dumping of waste acid into the North Sea from the end of 1989. Certain European nations, however, are to be permitted to continue, in some cases up to 1993.

KEMIRA INVESTS IN TiO_2 R & D FACILITIES

Finland's Kemira Oy is investing FM36m (\$8.4m) in a new pilot plant facility and laboratory extention at its Vuorikemia titanium dioxide plant in Pori.

The pilot facility will be used to test titanium dioxide and pearl lustre pigments and production methods, with emphasis on environmental protection. The laboratory extension is to meet a growing requirement for product resewarch and application tests.

Development director Kari Kurki said the company has a range of products at the developmental stage, but declined to give details.

Work on the pilot plant and laboratory extension is due for completion mid-1990. An announcement on the engineering contractor is expected shortly.

UK AND YUGOSLAVIA TO COLLABORATE ON WIND ENERGY

UK and Yugoslavian wind energy experts have been discussing ways of promoting industrial collaboration between the two countries.

The talks, which took place during a two-day seminar at the National Engineering Laboratory in East Kilbride, were held as part of the UK-Yugoslavian agreement on science and technology.

The Yugoslavian party is in the UK on a fact-finding trip organised jointly by the National Wind Turbine Centre and the Department of Trade and Industry. It is hoped that private talks between the delegation and UK manufacturers will lead to sales for British companies.

Other venues on the tour included NEL's test site at Eaglesham, wind turbine installations on the Orkney Isles and the Central Electricity Board's facility at Carmarthen Bay in South Wales.

FLUIDISED BED CUTS PRODUCTION FLOW COSTS

British United Shoe Machinery has replaced its existing heat treatment facilities with a £40,000 fluidised bed furnace, resulting in annual fuel cost savings of £11,500 and a payback in less than three and a half years. It is one of outstanding entries in East Midlands Electricity's PEP (Power for Efficiency

and Productivity) awards competition. The Leicester factory's heat treatment process was formerly a batch sealed quench furnace and a neutral salt bath. The heat treatment plant was composed of quenching equipment, water cooling jackets, oil heaters and coolers, atmospheric and oil agitation fans and an automatic sequencing system. With so many functions involved in the process, maintenance and repair costs were high and excessive down time was suffered due to breakdown.

Operating on gas and electricity, the quench furnace and salt bath incurred running costs of £15,500 per annum. The two units were replaced by a 45kW fluidised bed supplied by Rosin Engineering of Stourbridge. Besides having drastically cut running costs, the change has provided lower unit production and maintenance costs, reduced processing time, permitting increased output and the ability to meet 'just-in-time' production requirements as a result of the equipment's flexibility in operation.

In addition, the removal of an awkward production bottleneck has improved working relationships between manufacturing departments.

COMPOSITE CERAMICS WITH ALUMINA SILICON CARBIDE

Hitachi Metals Ltd. in Japan has established a manufacturing process for alumina-silicon carbide whisker composite ceramic which shows 95 per cent sintered density by a normal sintering method.

Alumina-silicon carbide composite ceramics have been studied intensively as a high toughness material. Hitachi has studied the optimum manufacturing process with the object of achieving a high density by a normal sintering method.

Alumina powders and silicon carbide whiskers are dispersed in 4 per cent polyethylene imine aqueous solution and are wet pressed in the experiment. By this, the shrinkage in the pressing direction at the sintering has been improved giving a better sintering density. A mixture of 85 per cent alumina and 15 per cent silicon carbide whisker is sintered at 1725 degrees C and 95 per cent of sintered density has been realized.

The sintered density strongly depends on the length distribution of the whisker used and the shrinkage in the thickness direction at the sintering is almost constant up to about 10μm. Composite ceramics for engine parts will be sintered at a high density in a practical shape by this process.

-- P.T.I. Science Service, December 16-31, 1989

WATERJET THAT SLICES STEEL

A contraption from which a needle-thin stream of water moves thorugh a slab of carbon steel and slices it cleanly and quickly into half has been developed at the University of Rhode Islands in the United States. The high-tech knife carves up hard ceramics on which even diamond-tipped saws bounce off without making a scratch.

A laboratory at the University took but a minute to make a 1.4-inch-long slice in an inch-thick zinc-nickel-steel composite. In comparision, electro-discharge machining, a widely used way to make fast and clean cuts, goes through only a tenth of an inch, the journal said. Waterjets zip thorugh inch-thick pieces of aluminium at a rate of four inches per minute. While lasers don't cut transparent materials, waterjets dissect a foot-and-a-half of inch-thick glass in a minute, it said.

In fact, a waterjet can cut any material without heating it and without the distortion that charactarizes many other cutting methods. And this knife releases no toxic dust and needs no sharpening. The water stream captures all the dust, which is then filtered out in a collection tank, it said. Though waterjets have been around since the 195 models were slow and were u marily in mining, the journal

The latest waterjet works in lowing way: the process filters t to remove particles larger th microns. Compressed to as m 60,000 pounds per square inch (water moves through reinforce to the cutting head. There, the a is added, and the stream shoot 2,000 feet per second.

-- P.T.I. Science S December 16-3

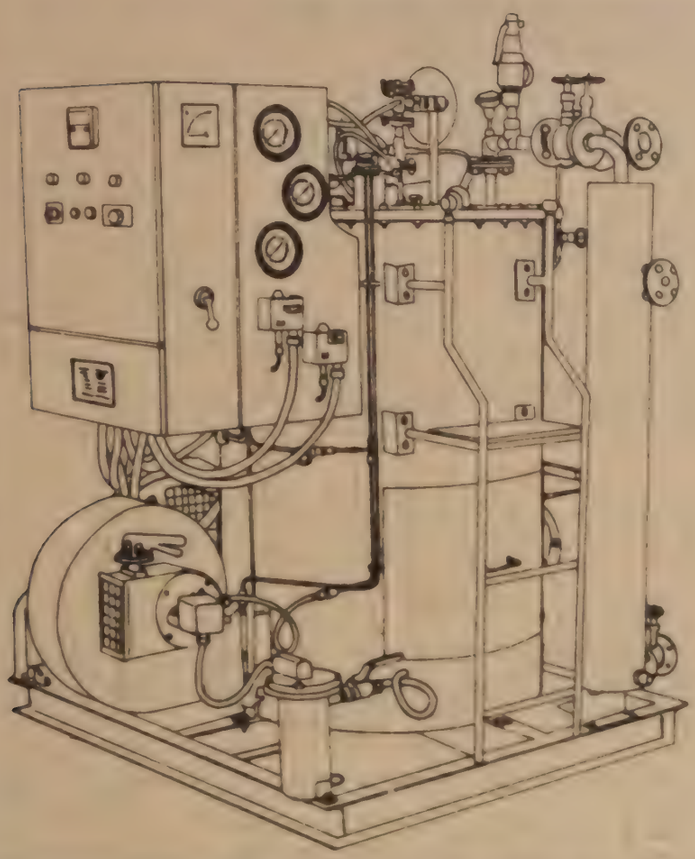
ENVIRONMENTALLY CO IBLE SHOTCRETE METH

In cooperation with the A Research and Technical S Department of Degussa A Essen-based company HOCHTI has developed a pro-environment cess for wet-mix shotcrete. The process is accelerated by a p reaction and not a chemical on

The conventional additives are ced by amorphous silicon dioxid des Sipernat 22 S or FK 320 DS i der form. These products spontan remove some of the mixing wate the soft, pumping-consistency co mixture shortly before it reach spraying nozzle, also acting as c lization nuclei in the cementing re

The new method has already p itself to be highly economical i eral instances. It has been use example in a permanent enclosur construction pit in Berlin, an renovating a sewage treatment Furthermore, it has been used for ling a non-settling pump shaft in ogne and also in a single-layer t lining in Bielefeld.

The amorphous powder silicas ernat 22 S and FK 320 DS are pro by Degussa at its Wesseling plant Cologne, and by Degussa subsid at many locations around the w



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Pollution abatement for small paper mills — Problems and prospects*

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stract

The small paper mills cover nearly 50% of total installed acity for paper and boards in India. However, they are held responsible for contributing to 75% of total pol-on load discharged by the paper industry. The principal son for this situation is non-availability of a commercially ble chemical recovery system. The twin constraints in lving such a system are

mall chemical pulping capacity; and
se of straw as primary raw material.

A detailed techno-economic evaluation has been made of ious potential treatment options targeted to meet the string- effluent standards, while leading to chemical recovery/ rgy conservation. A review of emerging technologies and ir impact on pollution abatement in small paper mills as l as big mills is presented.

roduction

The proliferation of small paper mills (capacity less than 00 tpa) in the last two decades has substantially contri-ed to the growth of paper production in India. Today some hem have expanded their capacities upto 24,000 tpa and y share nearly 50% of present total installed capacity of million tonnes per annum. While it is comforting to rec-ise that these small paper mills have achieved this distinc- without affecting the Indian forest ecosystem, as they mainly agrifibres and recycled fibres, it is very disturbing ealise that these small and medium paper mills discharge id effluents with pollution loads nearly three times the nbined pollution load of all big mills.

The principal reason for this malaise is the non-availability commercially viable chemical recovery system for these ls, leading to draining of more than 36,000 tpa of recov-ble caustic and the resultant wastage of 90 million units carce electric power. With the strict enforcement of pol-on standards by various environmental/pollution control rds, many of these mills are under threat of imminent clo-. Reacting to this alarming situation, the financial insti-ons and Government of India (GOI) who have given al/financial assistance to these mills, are promoting deve-mental work on identification and demonstration of viable mical recovery systems for these mills. The author was principally involved in one such feasibility study, undertaken two years ago at the request of the Industrial Credit and Investment Corporation of India Limited.

The pollution problem of small paper mills due to the twin constraints of size and use of agro-wastes is also relevant to big paper mills, as they are being compelled to augment, their raw material sources through adoption of small agro-based pulping line. Further the newsprint mills have also to address pollution problems of similar nature arising from CTMP/CMP pulping sections. Therefore, critical review of the various options available and identification of suitable commercially viable system for abatement of pollution from small paper mills assume a wider perspective and urgency than it did ever before.

Magnitude of pollution problems of small paper mills

To bridge the gap in demand and supply, Government of India encouraged in the Seventies, the establishment of small paper mills based on unconventional raw materials. The growth in small paper mills during the last two decades, categorywise is given in Table 1. All paper mills less than 10,000 tpa were defined initially as small paper mills and received concessions and fiscal incentives from Government and financial institutions. These mills were based on agricultural residues and recycled fibres without any chemical recovery. According to a notification issued by the Ministry of Industry in 1984, the small paper mills based on unconventional raw materials had been redefined to include mills of installed capacity upto 24,000 tpa and also not having a plant attached thereto for making bamboo and wood pulp. Since then, many small mills of capacity 10,000 tpa have expanded upto 24,000 tpa. Therefore the definition of small paper mills for the present paper includes all categories including a few in category I (above 20,000 tpa).

However, by about this time, the financial institutions took a policy decision not to fund in future any small paper mill if it was based on chemical pulp manufacturing without a chemical recovery system. The quantum of chemical produced by these small mills varies from nearly 100% to as low as 5% in some mills. The balance raw material furnish consists of waste paper and imported pulp. The pollution loads due to waste paper and imported pulp are insignificant compared to the load arising out of use of chemical pulp without chemical recovery. The pollution load from agro-based small paper mills, due to absence of chemical recovery, is about three times in terms of BOD and COD and about four times

per presented at CESE-IIT Bombay State-of-the-art Symposium on ment Options — Sugar, Distillery, Paper and Allied Industries, mber 7-8, 1989.

Table 1
Trend in category-wise growth of paper mills

Category	1951	1961	1971	1981	1989	Installed capacity (tonnes/annum) (As on 1.1.1989)
I	2	6	14	22	30	14.6
II	3	4	3	9	24	3.8
III	2	3	7	31	87	7.3
IV	5	8	12	33	107	3.6
V	5	6	10	41	57	0.9
Total	17	27	46	136	305	30.2

Source: DGTD
Note:
Category: I Above 20,000 tpa
II 10,000 to 20,000 tpa
III 5,000 to 10,000 tpa
IV 2,000 to 5,000 tpa
V Below 2,000 tpa

in terms of lignin compared to big mills. The comparative pollution loads are furnished in Table 2.

Recognising the problems and financial constraints of small paper mills and based on NEERI's comprehensive document for small paper industry, Central Pollution Control Board has evolved Minimal National Standards (MINAS) for discharge of waste waters for small paper mills. The standards of IS and MINAS and the characteristics of effluents discharged by big and small mills are furnished in Table 3. It can be seen from these standards that no limit for sodium content or colour has been set and in MINAS even COD limit has not been specified. Due to absence of chemical recovery, these small mills cannot meet any of these standards and they discharge the effluent after some primary treatment into land for irrigational purposes.

Because of the growing problems of land availabil concerns raised on the possible increase in the alkali soil, the small paper mills are under great pressure t treat their effluents. The MINAS limits have to be ac by all small paper mills sooner otherwise they will f face threat of closure.

Besides pollution loads, the magnitude of caustic and the corresponding electrical power wasted can be a iated from the following estimates:

1. Total agro-based raw materials consumed by smal mills (2) - 400,000 tpa.
2. Caustic consumed at an average of 12% on raw m - 48,000 tpa.
3. Recoverable caustic @ 75% recovery efficiency - tpa.
4. Electrical power required to generate this caustic @ Kwh/t - 90 mil. units.

In addition to above the lignin discharged in the e not only results in wastage of energy in terms of its fue but also leads to colour load of 1400-1500 PCU per

Table 2
Pollution load from paper mills
Based on actual production in 1988 (1,2)

Description	Big paper mills	Small paper mills	Total
Number of paper mills	30	275	305
Installed capacity (m. tpa)	1.46(48)	1.54(52)	3.00
Actual production (m. tpa)	0.83	0.88	1.71
Suspended solids (tpd)	298(48)	328(52)	626
$BOD_5$20°C (tpd)	115(25)	350(75)	465
COD (tpd)	493(25)	1467(75)	1960
Lignin (tpd)	65(19)	275(81)	340

Figures in parenthesis are percentage values. It is assumed that the actual production is 57% of the installed capacity in both big and small

Table 3
Characteristics of effluents and standards (1)

scription	IS-2490 (1974)	Big mills	Small mills (agro-based)	MINAS
H	5.5-9.0	6.0-9.0	6.0-8.5	6.0-9.0
spended solids (mg/l)	100 (max)	300-450	400-1100	100
ODs 20°C (mg/l)	30 (max)	100-160	220-1100	50
OD (mg/l)	250 (max)	500-700	2000-4800	--
gnin (mg/l)	--	80-100	300-700	--

f pulp, as it has been estimated that 90% of the colour is ue to lignin. Although there is no stringent legislation for e discharge of colour by Central Pollution Agency, some tates have imposed tolerance limits in this regard.

roblems in adopting conventional chemical recovery ystem

imitations of size

Though many small paper mills are operating at capacity evels of 20,000 tpa, the chemical pulp produced out of agro-ased raw materials exceeds 10,000 tpa only in few mills. Based on a recent survey (2), it is observed that only about 30 mills are producing chemical pulp in excess of 30 tpd. It has been very well documented by various authors (3,4) hat conventional chemical recovery system, based on roaster/ smelter is not viable or only marginally viable even for chem-ical pulp capacity of 30 tpd, the principal reason being that the energy cost (steam + power) is more than 80% of oper-ating cost (excluding interest and depreciation). But a more energy efficient modern chemical recovery system (normally designed to be self sustained in energy) is also not economi-cally viable due to the high capital cost involved. This means the classical approach will not help to save the energy lost (in terms of fuel value in organics and electrical power in caustic) in the effluent discharged by these mills, though pol-lution standards can be met. In fact one of the small paper mills of 30 tpd chemical pulping capacity did install recently a smelter system (without heat recovery) and had to shut it down due to low energy efficiency.

Raw material constraints

The two principal raw materials used by small mills are straw and bagasse. While limitations of size applies to both raw materials, in case of straw the problems of viscosity and silica adds a new dimension to the problem of chemical recovery. It should be clearly understood that desilication of rice straw black liquor (when it is commercially proven) may not be economical for small mills of even 30 tpd capacity. Ironically there are now more straw based pulp mills of capac-ity more than 30 tpd than bagasse based mills and there is every likelihood of such mills proliferating. Silica is not the only problem of straw based liquors — rice, straw liquors have higher viscosity and are colloidally unstable at concen-trations above 30% (5) and, therefore, conventional evap-oration and combustion of spent liquor are beset with problems that are too difficult for small mills to cope with.

Process technology deficiencies

Since the small mills were conceptually designed for low capital cost, many of them were implemented with inade-quate process technology as enumerated hereunder:

- The raw material preparation in terms of efficient depithing of bagasse or wet cleaning of straw, is not adopted or tech-nically inadequate in almost all small mills;
- All mills excepting one or two use batch rotary/tumbling digesters and this results in low concentration of spent liquor due to high bath ratio maintained in cooking or due to one stage washing in digester;
- More significantly, many small mills have only two stage pulp washing and a few use only single stage. Due to poor raw material preparation, the washing efficiency is low inspite of using high wash water, leading to further low-ering of spent liquor concentration. It may be appreciated that brown stock washing stage plays an important role and hence forms critical part of chemical recovery system.

All the above process deficiencies need to be addressed and the resultant increase in capital costs has to be fac:ored into while planning for a chemical recovery system for these mills.

Review of alternatives to conventional chemical recovery

Any alternative technology or process route should there-fore evolve around features that reduce energy cost and/or capital cost as these two are, as discussed earlier, principal factors influencing economic viability.

DARS - Ferrite recovery process

This system was developed basically with a view to con-serve fuel energy used in reburning of lime (where silica is not a contaminant), and save capital cost in respect of caus-

recovering chemicals from spent liquor from CTMP/CMP stages. A screw press can be used to squeeze out residual liquor to obtain a reasonable level of solids concentration (4-8%). This is subsequently prefiltered in a cartridge filter and processed in a Ultrafiltration to recover ligno-sulphonates which can be sold or incinerated. Detailed work carried out in a pilot plant in Canada has shown BOD reduction of 60% (16). Colour is also expected to be removed. The high flux rates obtained even at elevated temperatures is indeed encouraging, in the context of small paper mills (categories IV and V) who also can now resort to, perhaps, sulphite pulping, which gives higher yield. Further developmental work needs to be done in this area.

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Key success factors in an advanced control project*

MYKE J. KING
KBC Advanced Technologies Ltd.

Introduction

Over the past decade advanced control projects have been implemented in major refinery and chemical plants all over the world, giving substantial benefits to the end users. These benefits may only be realised if the project is carefully planned and executed. This paper aims to show what is meant by the term "advanced control" and what factors are important to the successful execution of an advanced control project.

Hierarchy of plant computerisation

Figure 1 demonstrates that the term "advanced control" can be applied to increasing levels of technology which achieve simple control objectives more effectively. Similarly it can be used to describe strategies which enable more complex operating objectives to be achieved. Either way advanced control involves improving the operation of a plant by moving through a control hierarchy. In order to achieve an improvement at the next level, it is necessary to obtain success at the current one. For instance, regulatory control of a distillation column is only possible if the plant instrumentation is both adequate and operational. Having achieved satisfactory base level control it is then possible to progress to advanced regulatory and constraint control. The most benefits are obtained by implementing plant optimisation with the use of optimisation packages and plant management information systems.

Incentives for advanced control

Before embarking on an advanced control project it is necessary to be aware of the optimum operating strategies on the plant and the physical constraints and product quality limits that define the optimum operation. Planning tools like DISTOP, VISTOP, CATOP and PETROFINE can identify these operations and provide the sensitivity of operating profitability to the closeness of approach to the operating constraints or targets.

From experience of the application of different degrees of advanced control it is possible to quantify the movement towards optimum constraint and operating targets that can be achieved. This information, together with the above sensitivity of operating profitability, leads to estimates of the incentives for various types of projects.

Incentives for regulatory control

When it is desired to operate at a constrained optimum, for example, product quality, any movement away from this optimum costs money. Poor control due to lack of sufficient instrumentation or understanding of the plant operation would not enable operation anywhere near the optimum. The introduction of regulatory control and improved response to plant disturbances would allow the optimum to be more closely approached. Advanced regulatory control, for example feed forward control with dynamic decoupling, allows operation

Definition of 'advanced control'

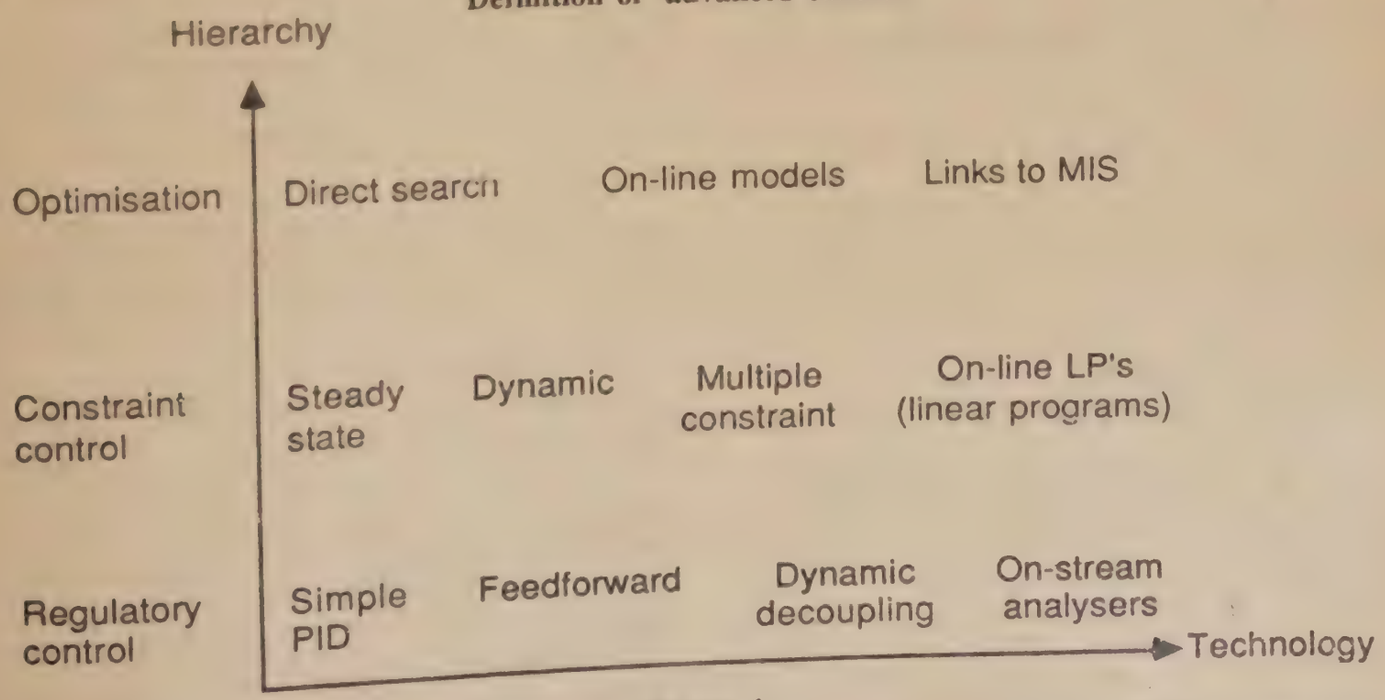

Figure 1

* Paper presented at the Oil, Gas and Petrochemical Seminar in 1989.

much closer to the optimum giving increased benefits and a more stable and safe operation.

In plant operations where there is an unconstrained, desired operating value, the incentive is to prevent large swings around this value. Operation at an unnecessarily high severity, for example, when it is not desired, costs a disproportionately large amount of money. This in turn makes average operating costs higher than they would be if the operation was closer to the desired value.

In addition there are less tangible but nevertheless potentially large benefits which arise from the installation of modern control systems. These include:
— reduction in maintenance costs;
— more effective use of process operators;
— faster diagnosis of operating problems;
— reduced possibility of operating error;
— increased staff motivation;
— faster implementation of changes in operating philosophy;
— improved public image and customer credibility;
— easier recruiting;
— reduction in control system failures.

Incentives for constraint control

As mentioned earlier, there are substantial benefits in operating as close to a constraint as possible. This is particularly true when the constraint is moving. It is then desirable to use constraint control. Typical applications would include maximising FCCU conversion or feedrate. The incentives for constraint control are shown in Figure 2. Operation away from the constraint loses benefits, but so does poor response to changes in the constraint.

Incentives for constraint control

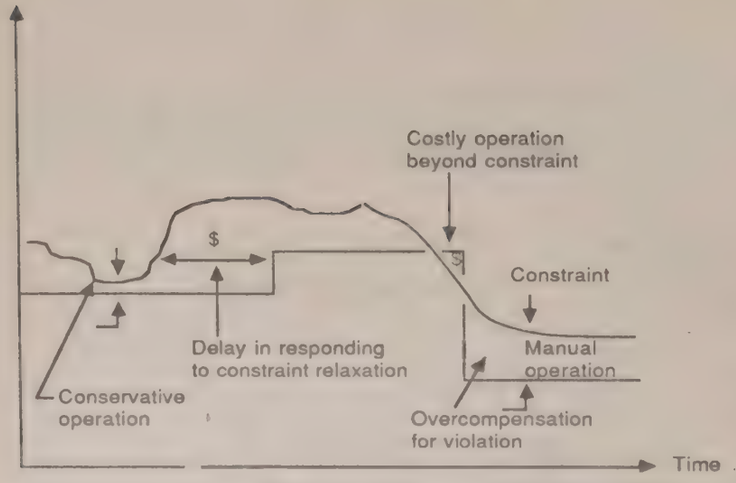

Figure 2

Incentives for optimisation

Every unit operation on a refinery has an optimum pro function for a given set of plant conditions. The maximu benefits from a control application may be achieved if th optimum is identified and the plant control is moved towar it. As the plant conditions change, however, so does the op mum. An on-line optimisation package will track this fun tion and ensure that the plant is always operating at maximu profit.

Incentive for manufacturing information systems

Traditionally plant information on a refinery has been co lected by engineers monitoring key operating variables a recording them on paper. While effective in obtaining som of the data, this method is not always successful for sever reasons. Firstly, while every endeavour is taken to collect t information on time, it always happens that if a proble occurs a particular piece of information is missing. Secondl having collected the data and evaluated it, there is little tim left to actually solve any problems which are highlighte

A manufacturing information system including an int grated process, laboratory and inventory database can co lect data and manipulate it on a continuous basis, leaving mo time for actual problem solving. This ultimately leads increased yields and saves energy, losses and manpowe Planned performance is also enhanced by better planne maintenance and turnaround periods.

Advanced control project planning

It is essential when planning an advanced control proje to integrate activities. If the ultimate goal is a site-wide pr cess control and information system then all activities shou be planned with this in mind. It is unlikely to be practic to install fully integrated computerisation as one project. number of sub-projects will lead to the same result provid each is consistent with the ultimate goal.

The "flow" of an advanced control project should pa through several well defined stages from design to handov as shown in Figure 3. Initially a feasibility study must undertaken to determine whether the project is viable. Th is then presented to the management in order to gain co mitment and indicate the potential benefits of a control pr ject. Having gained approval for the project the next st consists of the conceptual design of the applications. Th involves plant testing and monitoring in order to calcula parameters for the controls system design. The applicati design at this stage is system independent but presents ea application in detail both as a description and flow diagra The "black box" approach of having many signals enteri a box on a flow diagram and one signal leaving as a set po to a controller, is fine for indicating operating objectives b can lead to confusion at the design stage.

Advanced control project plan

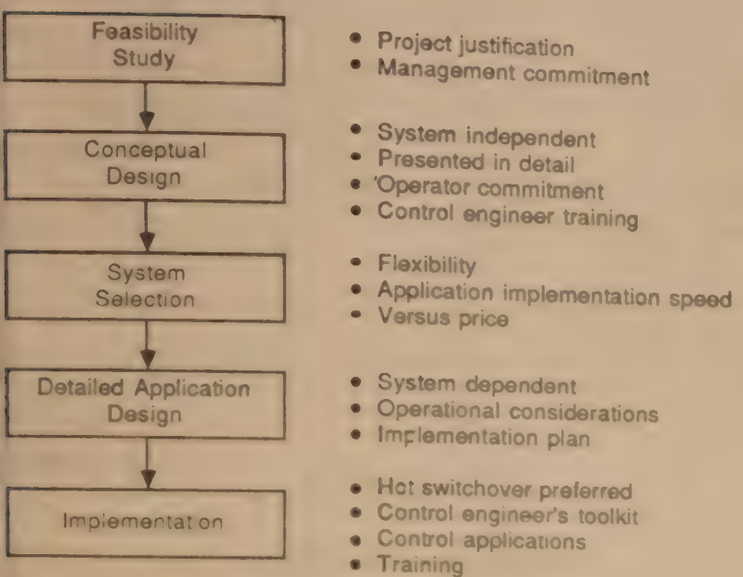

Figure 3

The control application designs may then be reviewed at eliminary meetings with the "users" (operations) in order gain acceptance. This also provides the initial part of the ent's control engineers training. A system is then selected ich is best able to achieve the desired results. Many fac- s come into consideration here, for instance, ease of con- uration, flexibility, computing power, operator interface, d so on. Having chosen a system, the applications are igned in detail for compatibility, although the concepts still the same. Finally, the applications are installed on plant. The success of the whole project rests on a well nned and executed implementation phase. Applications ould be implemented in order which maximises benefits also gains operations and management commitment. The of design aids such as CUPID can also increase accep- ce by increasing the initial success rate of installed appli- ions.

npower planning and organisation

A typical advanced control project involves the integra- n of several types of manpower such as the client's own ineers, the engineering contractor, the vendor's installa- n engineers and the advanced control specialists. The max- um input from application engineers occurs at the inning and the end of the project, that is, the design and lementation stages. It is significant that the success of the ject depends on these stages being well executed.

The most important aspect of an advanced control project o have a well balanced organisation which stays together the length of the project, and in the case of client's engine- ers, behind. The team should consist of a project manager and representatives from the client, the contractor, the vendor and experienced advanced control specialists. The client's staff should come from process, systems, instruments and control, with the advanced control specialists providing additional control resource and training the client's engineers for long term support. Long term support of the applications can produce large impacts on the benefits. For instance, without the necessary manpower of the right skills, applications service factors can be as low as 35%. For as little as 5% of the project cost, the additional skilled manpower to support the control applications could have an impact as great as 60% on the benefits by increasing service factors to over 90%.

Monitoring performance

A typical graphical representation of performance monitoring for an advanced control project is shown in Figure 4. The theoretical maximum benefits obtainable are those which could be achieved if the best technology were used and plant conditions were always ideal. A practical maximum figure is arrived at by only considering applications which are able to be implemented within the scope of the project due to constraints on return on investment. By the same token certain applications are not considered viable since the implementation effort required would not yield sufficient benefits a target for applications which can realistically be implemented and return sufficient benefits may then be arrived at, which is usually around 95% of the theoretical maximum. Since applications rarely have a 100% service factor due to process and instrumentation problems, an achievable target of 90-95% of this figure is set. As the project proceeds the benefits attained may be monitored against the targets. The result is that achieved benefits are usually higher than predicted.

Monitoring performance

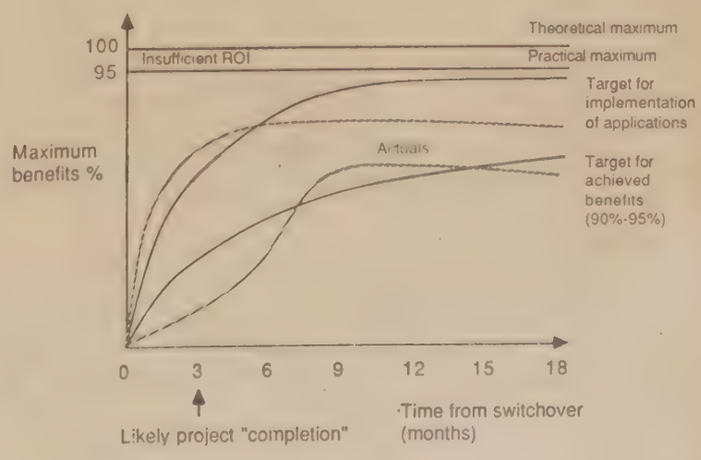

Figure 4

Summary

To capture all the potential benefits an integrated approach is required. With the help of planning tools such as PETROFINE, benefits identified by studies will be maintained despite changing economic objectives. Linked with information systems, monitoring tools such as DISTOP and CATOP produce rapid diagnosis of operating problems. Advanced controls ensure that the process is consistently held close to its optimal operation. The interrelation between these factors is illustrated in Figure 5.

Use of a systematic approach to advanced control projects ensures lower costs and earlier capture of these benefits. Figure 6 shows the effect on payback. Figure 7 shows the further improvement to payback possible by adopting proper implementation methodology.

Benefits of integration

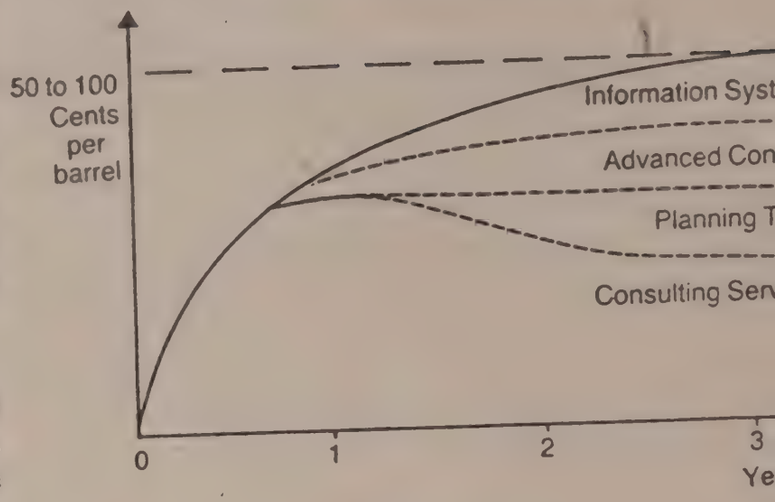

Figure 5

Getting the design right

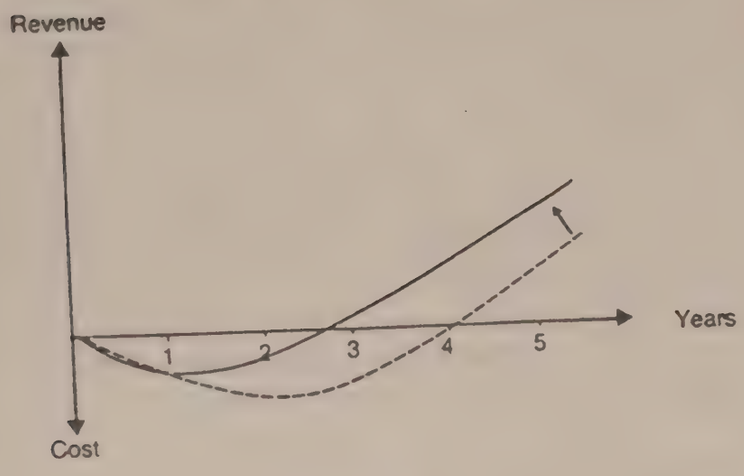

Figure 6

Getting implementation right

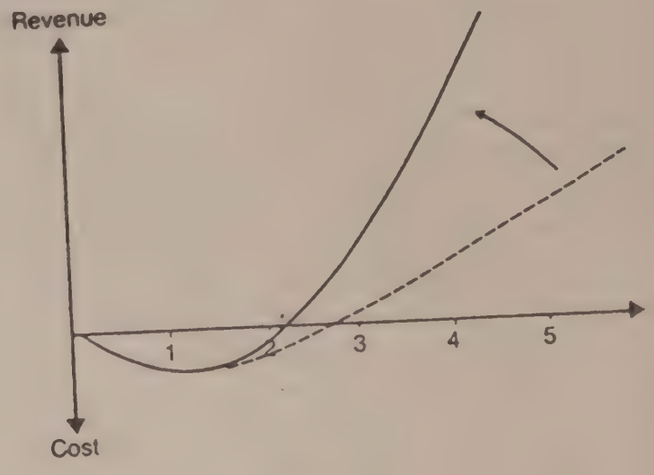

Figure 7

Oil spill management: Possible role of biotechnology

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P.O. Petrochemicals, Baroda 391 346.

bstract

Damages caused by oil pollution are both significant and verse. Cleaning up an oil polluted area is time consuming, fficult and costly. During the last few years, number of biochnological developments have taken place, which may rovide a better solution with relation to physico-chemical rocesses in the near future.

ntroduction

Oil spill has become an unavoidable part of oil industry, ecause of increasing production and transportation activies. The situation is alarming world wide and needs attenon. Cleaning up an oil contaminated area is time-consuming, ifficult and costly. To the cost of cleanup must be added ie cost of oil invasion itself, the destruction of fish and other ild life, damage to property, contamination to public water upplies and any number of other material and aesthetic sses. Depending on the type and quantity of oil involved, ese losses may extend from months to years, sometimes r decades, with correspondingly heavy cost on restoring e area to prior condition.

ffect of oil spill on the environment

Damages caused by oil pollution are both significant and iiverse. Such pollution can destroy or limit marine life, ruin ildlife habitat, kill birds, limit or destroy the recreational alue of beach areas, contaminate water supply and create re hazards. It is difficult to evaluate the effects of oil since is not a single substance but a complicated mixture of literlly thousands of chemical compounds. Some of the toxic ffects especially with reference to oil pollution in marine nvironment can be noted from following points. (1,2):

- Direct kill of organisms through coating or contact poisoning
- Prevention of gases exchange across the air-water interface, causing oxygen shortage for aerobic organisms
- Prevention of light transmission, thus stopping photosynthesis — a vital process for cellular synthesis in green plants
- Incorporation of sublethal doses of oil into organisms resulting in reduced resistance to infection and other stress
- Destruction of food values through incorporation of oil and oil products, into fisheries resources
- Interruption of numerous events necessary for the propagation of marine species and for the survival of those species which stand higher in the marine food web.
- Incorporation of carcinogens into marine food chain and human food sources.

The fate of spilled oil

Spilled oil in sea water is altered first by physical movement. Oil can move to a greater distance in water and as it moves it changes chemically. The processes involved in changing oil chemically are collectively called weathering or natural degradation (2). They include:

1. Spreading
2. Evaporation
3. Dissolution
4. Emulsification
5. Auto-oxidation
6. Microbial degradation
   - 0- aerobic microbial oxidation
   - 0- anaerobic microbial oxidation
7. Sinking
8. Resurfacing

How fast oil degrades is markedly influenced by light, temperature, nutrients and inorganic substances, winds, tides, currents, and waves. Degradation rate appears to vary with the composition of oil. The more toxic fractions are generally less susceptible to microbial attack. The heavy residue that do not degrade may be deposited in sediments or they may float as tar lumps or tar balls.

Physical-chemical treatment of oil spill

A number of factors influence the choice of oil spill removal techniques, including type & amount of petroleum products spilled, water current, weather, equipment available, and such special considerations on the presence of marine life, closeness to drinking water intakes, fishing ground, wildlife habitat or bathing beach. Once a spill has been contained, clena up measures can be instituted. Following physical-chemical methods are being undertaken to remove oil spill:

1. Dispersion

Dispersants serve to increase the surface area of an oil slick and disperse oil globules throughout the larger volume of water. Then in time, nature takes care of it by bacterial action. Chemical dispersants are usually applied by spraying, and agitation usually is necessary to insure proper mixing. Wind and wave action is some time sufficient. After widespread dispersant use during the major incidents, reports led to the conclusion that dispersants or the dispersant-oil mixture caused more damage to aquatic life than the oil alone. For beaches, they actually compounded the problem by adding to the amount of pollutants present, by causing the oil to penetrate more deeply into the sand, and by disturbing the sand's

compactness, so as to increase beach erosion through tidal and wave action.

2. Sorption

Oil is soaked by an absorbant; it clings to the surface of particles on a absorbent. Materials used for this purpose include straw, foamed plastics, cotton waste, talc, and dried volcanic rock; and are selected based on their properties for picking up oil. In general, the lower the density of sorbent, the more oil it can pick up per unit weight. Based on the origin, sorbents may be divided into three general classes: 1. natural products, 2. modified or chemically treated natural products, 3. synthetic or man made products.

3. Sinking

It is also possible to dispose of floating oil by sinking it. In sinking operations, special powdered materials are spread over the oil. The oil adheres to the surface of these materials; the combination being heavier than water, sinks to the bottom. Various kinds of natural materials and synthetic products are available which are claimed to be effective in sinking oil slicks. Typical agents include treated sand, brick dust, cement, silicone coated materials, fly ash, and special types of clay. Sinking agents are believed to be most efficiently employed on thick, heavy and weathered oil slicks in contrast to relatively light and fresh oil. These agents must be evenly distributed over the surface of slick and supplied with proper mixing, agitation and time interaction. The particles coated and agglomerated mass eventually becomes heavier than water and sinks to the bottom.

4. Gelling/Coagulation

Gelling agents may be applied over the surface of periphery of floating oil slick and intended to absorb, entrap, fix or make the oil mass more rigid or viscous so as to facilitate subsequent physical or mechanical pick up. Possible gel agents include molten wax or soap solution, lanolin, liquid solutions of natural fatty acids, soap of alkaline metals, treated colloidal silicas, the amine-isocyanates, and the polymer systems

5. Magnetic separation

This process involves dispersing a hydrocarbon base ferrofluid containing an oil soluble, water-insoluble surfactant and a stable colloid of magnetic solids, e.g., magnetite into the oil slick, then using the magnetic field to attract and pickup the oil spill, which is now magnetically responsive.

6. Combustion

Another way of disposing of oil on water is to burn it. The success of this method depends on supplying the blaze with sufficient oxygen and keeping it hot enough. One problem is that the thin layer of oil is cooled by the water, making it nearly impossible to ignite. So for burning the oil slick a thickness of more than 2mm is required. However, th disadvantages in burning. It results in air pollution, and create fire hazard. For these reasons, burning is not practical in sheltered water, although it may be desi burn oil on the open sea.

Biotechnological developments for possible treat

A. Use of hydrocarbon degrading microorganisms

Natural degradation process depends on the activi microorganisms. It is an established fact that practicall petroleum hydrocarbons are sensitive to microbial enz The natural process of biodegradation of oil by the n microflora is very slow; hence it takes a long time to re oil. Addition of external microbial cultures will, the greatly enhance the process rate.

The ability to degrade or chemicaly modify hydroc molecules is wide spread among the microorganisms an lowing general observations are made (3). a) Aliphatic h carbons are degraded and assimilated by a wide ran microorganisms. Other classes including aromatics m partly oxidised but are assimilated only by a few bac b) n-alkane of chain length shorter than n-nonane are no ally assimilated but may be oxidised. Relatively few bac have the ability to grow on alkanes shorter than n-oc The short chain liquid hydrocarbons are thought to be substrate because of their toxic effects on microbes. A chain length of n-alkane increases beyond C_8, the factor increases. c) Saturated compounds are degraded n faster than unsaturated ones. d) Straight chain compou are degraded more easily than branched ones.

Before biodegradation can occur, hydrocarbons hav enter the cytoplasm of microorganisms and there is some troversy over the mechanisms used to take up these substr with low water solubility, especially the liquid ones (4). initial interaction takes place either by contact of micr ganism with insoluble substrate directly, i.e. without inv ing a mediator (unmediated interaction), or by the con through a mediator (mediated interaction). Mediator play role by emulsifying the hydrocarbon.

A model method for using mixed microbial culture been discussed by Chauhan and Goyal (5). Here a low t icity dispersions with improved microbial cultures toget with phosphorous and nitrogen minerals should be spray on the water surface containing spilled oil. The oil globu with dispersants microorganisms and added nutrients w spread over the water surface. The microbial cells will st multiplying and in the process will destroy the oil and d persant. The microbial biomass formed as a result of grow will die for want of food when the oil quantity is exhauste The dead biomass then enters the marine food chain.

has been established that key steps in the degradation me hydrocarbons are plasmid mediated. In a recent study, okwasili et. al. (6) has concluded that plasmid acquisi- by bacteria may be part of their adaptation to conditions drocarbon contamination. Emulsification and subsequent adation of hydrocarbon by these bacteria suggest that they prove useful in the weathering of oil spills.

he challenge of finding a bacterium to degrade all kinds il spills is formidable. Mixed bacterial cultures can offer er prospects, but instability of mixed culture and com- ion among the individual strains would be a drawback. aps the most promising long term approach rests in gen- ally constructing a suitable bacterium. Prof. A.M. Chak- rty has already shown in 1976, the possibility of this roach by combining the plasmids from four different bac- al strains, capable of digesting different types of hydro- on, into one organism. This organism has a much faster wth rate on crude oil than any of the individual strains shows promise as a means for dealing oil spills. (7).

Use of biosurfactants/bioemulsifiers as dispersants

iosurfactants are new kind of products, their complete ntial has not yet been realised. However, it offers number dvantages over the chemical dispersants (8). 1. They form stable emulsions because of their high molecular weight, hey have shown higher surface activity in number of s, 3. They are stable even at temperatures upto 90°C and alt solutions upto 10% concentration, 4. They are non- , 5. They can be inactivated under mild conditions using ific enzymes, and 6. They are easily biodegradable.

iosurfactants/ bioemulsifiers are secreted in the culture ium during the microbial growth on hydrocarbons. Chem- y, they are high molecular weight compounds, consisting of lipids along with protein and/or carbohydrates (8,9). The most common hydrophobic group is the hydrocarbon chain of fatty acids. The polar or hydrophilic group includes a wide range of organic functional groups, such as, the phosphate containing portions of phospholipids, ester and alcohol function group of neutral lipids, the sugars of glycolipids, or acetate group. In the literature, these compounds are named as: sophorolipid, rhamnolipid, trehlose lipid, surfacctin, emulsan etc.

Oil-slick dispersion studies has been conducted by the group of Dr. Anand Chakrabarty in the USA by using an bioemulsifier (EM) isolated from Pseudomonas aeruginosa SB30 (10). The oil slick dispersing efficiency of EM was assigned a rating of 1.8, though the maximum possible efficiency is of 2 (U.2. Patent 600972). However, a number of experiments are needed to be carried out to explore the applicability of biosurfactants/bioemulsifiers for the control of oil spill.

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Chemical News From Abroad

GUSSAS TURNOVER UP IN HALF

he Degussa Group's turnover rose e second half of the business year % to 7,478 million Deutschmarks), and throughout the entire busi- year also by 6% to 14,357 million . As the principal growth in turn- was achieved abroad, the propor- of foreign origin increased by 1 centage point to 74%. Excluding cious metals value, turnover rose by in the 1988/89 business year.

Results for the Degussa Group again passed the previous year's figures for second half of the business year, ugh the growth rate was slightly n on the particularly high level orded for the corresponding period he previous business year. For the 8/89 business year as a whole, the gussa Group's pre-tax results of 338 lion DM were the best ever, up by % on the previous year. Degussa AG recorded higher pre-tax profits of 5 million DM (+ 11%) than in the vious year.

The Group's Corporate Sectors orted the following progress: The tals Sector registered an increase in nover of 2%, despite falling DM gold l silver quotations both in the second f of the year and throughout the year a whole. Results excluding precious tals increased more significantly by % and 7% for these respective per- s. Group results for the Metals Sector proved considerably in the second f of the business year, producing an erall improvement on the previous ur.

In the Chemicals Sector, turnover for second half of the business year rose 15% to 2,383 million DM, represent- a cumulative increase for the year 12%. The Chemicals Sector has once ain achieved outstanding results, hich must nevertheless be offset against higher costs for raw materials in the second half of the business year.

The Pharmaceuticals Sector (including Dental Division) recorded a cumulative increase in turnover of 12%. Results for both the Dental Division and the ASTA Pharma Group rose considerably in the business year. Growth in the Dental Division can be attributed to the particularly good first quarter of the business year, in which a high level of dental treatment was carried out before the German health reform.

Group investments in fixed assets totalled 531 million DM for the 1988/89 business year as a whole, compared with 449 million DM in the previous year. Investments in financial assets totalled 108 million DM (previous year: 85 million DM).

On September 30, 1989 the Degussa Group employed a workforce of 33,698, including 11,387 abroad. Personnel costs rose by 10% to 2,486 million DM for the business year.

Our production plants were very busy at the start of the new 1989/90 business year. As a result of the continuing high level of orders on our books, we expect our production facilities to remain operating at high capacity. Nevertheless, due to rising costs it will be no easy task to achieve further improvements in our results, given the high level already reached."

MONTEDISON DISCONTENT UNSETTLES ENIMONT

Montedison's directors have agreed that its contractual relationship with Enichem is to undergo substantial changes. This follows news that a controversial tax decree favouring Montedison's provisions to Enimont has been postponed by the Italian parliament until December.

The delay is the latest in a series of disagreements over the proposed tax law, now being investigated by the EC commission for possible violation of fair competition principles. If the law is not passed before 31 December 1989, when Montedison closes its balance sheets for 1989, the company will owe about L1.2-trillion ($908m) for the year.

This will derive from taxes on capital gains reaped from the transfer of its chemicals, fertilizers, fibres and elastomers assets to Enimont earlier this year. However, if the tax proposal passes in time, Montedison could defer payment of some L825bn of the taxes owed.

Montedison's chairman Raul Gardini says if the current situation continues it will go against the very premises on which the joint venture was founded. The claim had previously been rejected following Sir Leon Brittan's objections because it did not comply with EC ruling and legislation.

Meanwhile, the situation has aroused much speculation over Gardini's plans for Montedison. Certain sources say his statement is designed to influence the government towards granting the tax allowance.

Both the media and market observers are currently speculating over the possible sale of Montedison's 40 per cent stake in Enimont. Among those rumoured to be interested are Dow, which currently owns a majority stake in Montedison, BASF and ICI. However, said a source, "with the possibility of a non-Italian company moving into the market, the government will do all in its power to ensure that Gardini's demands are met."

However, other market observers are going as far as to say that Gardini is actually planning a complete takeover of Enichem's share in the Italian chemical partnership.

The chairman has already announ-

ced his intentions to do this when the venture's three year consolidation period is completed. However, one London analyst said this was highly unlikely considering Montedison's current financial situation. Meanwhile, some believe Enimont will be split into two separate companies, a move which will take the situation back to square one.

The ENI executive body has issued a statement saying that the Enimont venture would remain intact and neither company would withdraw its interest. Industry observers say ENI is quoted to have said, "Enimont is a prosperous partnership and we foresee no problems."

Meanwhile, the Italian government is still reviewing the tax situation and it is believed that a decision will be made recently when officials vote on the issue.

The latest developments have continued to create even more speculation, say sources.

The latest rumours in the Italian press say Gardini could still withdraw part of his interest in Enimont and a likely successor could be the Italian chemicals, defence and space group, Snia.

EC NEARS MERGER AGREEMENT

After over 15 years of discussion, EC ministers have finally agreed the outline of proposed community regulations on cross-border merger controls. Although some finer details are still to be resolved, the final draft is scheduled to go before council for approval on 21st December.

"We are reasonably hopeful of its adoption," a spokesman at DGIV, the competition directorate, said. The regulations would come into effect nine months after acceptance, and so should be in place by the end of 1990, he said.

Under the proposed regulations, all mergers with a combined turnover of over Ecu5bn ($5.69bn) and with not more than two thirds in one member state would be vetted by the commission.

In order to suit smaller countries without their own antitrust bodies, national authorities could also hand over to the commission oversight powers for mergers with a combined turnover of Ecu2-5bn. However, all national authorities would retain control over mergers in the defence and media sectors.

The commission would have to indicate its decision on a proposed merger within one month and give its final decision within four months, said the spokesman.

Ministers are still in disagreement over whether national antitrust bodies could still disallow a merger approved by the commission. West Germany, in particular, wants its Bundeskartellamt to retain veto powers for larger mergers. A compromise has been suggested however, under which the commission could delegate its veto powers back to the national authority if the antitrust problem was specific to that country.

BASF DISCUSSES BRAZIL PROJECTS

BASF's Chairman in Brazil, Heinz Wollenweber, has disclosed plans to invest locally an average of $80m/year over the next three years. He said priority will be given to small scale projects and industrial facility expansions.

He stressed the group will not be influenced by the results of the next presidential election in Brazil. BASF's projects were designed according to market opportunities and do not change with political will, he added.

One of the new projects to go ahead is a choline chloride plant, to meet demand for animal feeds production at Camacari. The cost of the pro around $5m, confirmed the con

The remaining $80m, predict the next period, was not detai Wollenweber, but he confirmed cent was to be invested in en mental protection projects.

PROBLEMS LOOM AHEAD FRENCH STATE CHEMICA

While the broad lines of the re turing of France's state-owned c cals industry seem to be centred a two poles, Elf Aquitaine and Total most details are still to be firme

Although it appeared almost c that EMC would pass initially und umbrella of Elf Aquitaine's ho company ERAP, its fate now see depend on past losses of FF ($411m) accumulated over the which ERAP does not wish to mo

The fate of Orkem, meanwhi even less well established. The rep sharing out of its petrochemicals fertilizers to Elf and specialities to CFP, would mean cutting up Nors which comprises two of Orkem's divisions -- petrochemicals as we specialities. In fact it is rumoured the main stumbling block con Orkem's acrylates and methacry which company president Serge T ruk, who is due to take over To presidency in February, does not to give up.

Observers also query the fate o Orkem/Enimont agreement annou in the summer, which was to be ized by the year end. Although neg tions between Enimont and Orken proceeding "satisfactorily," negoti are unsure what effect restructuring have on the planned deal.

The deal involved a partnershi the expansion of the Dunkirk crack 320,000 ton/year and an asset s Enimont is to take over Orkem's

odity PE business at both Dunkirk and rling, together with its research and rketing activities. Orkem is to pick Enimont's methacrylates and acrylic sins business.

Also to be resolved is the matter of rkem's partner in the Copenor Dunrk petrochemicals complex, the Qatar eneral Petroleum Co. (QGPC). QGPC ok a 7 per cent stake in Norsolor while openor became a wholly-owned subdiary of Norsolor. Orkem and QGPC re also developing a long-standing artnership which involves a joint venure in the Umm Said petrochemicals omplex.

In addition to these questions, industry observers have doubts about the otential synergies to be achieved hrough the break-up of Orkem.

For instance, sources at Atochem see ew synergies between Orkem and Atochem's petrochemicals. Capacity additions, they say, would only add to the ectors of Atochem which are already affected by cyclical downturns.

Atochem's heavy petrochemicals would increase from the current 40 per cent to some 57 per cent of the company's total operations. In addition, Atochem would still not achieve the overall sales dimension needed to bring it on a par with the world's large chemicals groups.

Besides all the financial and judicial problems, the authorities now seem to be losing sight of the human aspect, which they had said was an important factor to be considered in any restructuring. In effect, there is great despondency within EMC and especially Orkem, which had developed a strong company spirit under the successful leadership of Tchuruk.

Meanwhile, Orkem has announced a new joint venture in Brazil teaming up with Eucatex (50 per cent) and Bamerindus (5 per cent) in an activated earths project. The new project, to be called Argilex, will be based in Maua, Sao Paulo state. It will involve an investment of around $6m to establish a 12,000 ton/year rare earths facility for rare earths which have applications in the production of vegetable oils. Argilex is aiming at a turnover of $6/year when operating at full capacity.

MEDIRACE AIMS FOR EUROPEAN BASE

The acquisition of Evans Healthcare by Medirace, the medical research and diagnostic products company, reflects Medirace's aim to develop the combined businesses into one of Europe's major players in the pharmaceutical market. Originally established in 1987 to research and develop Aids and cancer treatments, the UK concern has since expanded into diagnostic products with the acquisition of Cambridge Life Sciences and Walker Laboratories.

Although all of its acquisitions so far have been in the UK, the company is also looking at possible acquisitions in continental Europe, David Lees, director of Medirace, told the press. Evan's human vaccines activities are regarded as a particularly exciting area by Medirace, said Lees. It is currently sponsoring clinical trials in the UK and US to study the effectiveness of a form of BCG vaccine in treating superficial bladder cancer, and has also commenced work on producing certain antigens of the Aids virus. These areas are expected to complement Medirace's R&D, especially in the development of its Contracan cancer treatment.

The £87m ($136m) deal will more than treble the size of Medirace. It is to be financed principally by a rights issue. After the acquisition is completed, the company will seek an official listing on the UK stock exchange around the end of January 1990, said Lees.

Chemical markets abroad

FAR EAST ETHYLENE FUTURE REMAINS UNCERTAIN

Ethylene production is expanding vigorously in the Far East, but coordination among producers will be necessary if the market is to absorb the new capacity.

The availability of cheap Saudi imports for the Japanese market has, in the past, constrained the building of new capacity. Now, however, Japan's Ministry of Trade and Industry (MITI) is approving expansion by stages to meet the current buoyant demand. On the basis of MITI figures for quarter four, demand is up 7.9 per cent inclusive of exports while domestic demand has risen 4.7 per cent. Consumption this year is at 5.9m ton, and a growth rate of 4-5 per cent is expected over the next few years.

For Korea, assuming ethylene demand growth to be commensurate with GNP growth, a rise of 7 per cent/-year appears possible through to 1992.

In August, Japan's ethylene capacity stood (1989 being a year of periodical repair) at 5.49m. ton/year, 430,000 ton/-year more than the corresponding 1988 levels. By company, Showa Denko had passed from 488,000 ton/year in August 1988 to 632,000 ton/year (for years of no repair). It plans to attain 704,000 ton/year in October 1990. Mitsui Petrochemical Industries has attained an initial 92,000 ton/year capacity. Ukishima Petrochemical has increased levels from 851,000 ton/year to 968,000 ton/year.

MITI is now virtually certain to give the go-ahead to Mitsubishi's Kashima project for an estimated 500,000 ton/-year capacity. The facility may be operational in spring 1992.

Second in order of priority is the Maruzen-Mitsui Sumitomo joint venture at Chiba, for another 500,000 ton/year, expected on-stream in the spring of 1993.

However, even these "priority" ventures may be reappraised in the light of the future market situation. The outlook is far more doubtful for a second line of expansions planned by Showa Denko in Ohita, Mitsui and Toatsu Chemical in Ube, Asahi in Mizushima and Toyo Soda in Yokkaichi.

In Korea, there is concern that uncoordinated expansions will accelerate capacity build-up beyond market equilibrium.

With the coming on-stream of Yukong and Daelim's second plants at Ulsan (400,000 ton/year) and Yochon (250,000 ton/year) respectively, Korean capacity is set to reach 1.15m. ton/year. At present this is still insufficient to meet demand.

However, further impressive capacity expansions are expected over the coming years. Expansions will follow by Samsung (400,000 ton/year), Hyundai (350,000 ton/year) and Korea Petrochemical Industry (250,000 ton/year). These start-ups are expected on-stream by the end of 1991 at the earliest.

Korean capacity will thus reach 2.15m ton/year by 1992; by the end of 1993, levels may be almost five times their present value, at 2.43m. ton/year. "We are concerned about future levels of demand; we will need an adjustment in capacity," said a spokesman for one of the major participants in the next wave of Korean ethylene expansions. When asked whether his own group might revise its plans in the light of uncertainty over capacity absorption, another executive for the same group replied that it would be up to the later wave of entrants to exercise restraint.

In 1990 Korea is still expected to import 120,000 ton of ethylene from Japan, with which it has unrestricted trade. Western Japan may, howev the effect of the coming Korean sions. Estimated imports next ye Taiwan, Indonesia and Thailar 150,000, 70,000 and perhaps tons, respectively. Those com undertaking expansions in Japa Korea will be taking into accou planned expansions in Thailand, pore and the Philippines, all of will reduce the receptiveness of markets.

The outlook for derivative dem uncertain, with China cutting back tically on last year's purchases o yethylene. Support is at present co from the Pasadena outage, with Ph making toll deals to acquire hdPE its Phillips-process licensees in th East.

Ethylene inventories in Japan present above those in quarter 1988, but are decreasing. The co price for quarter three in the Far was $670/ton c & f Korea, a presently at $500/ton.

TANKFREIGHT SIGNS CONTRACT WITH A & W

Tankfreight, one of the UK's la third party bulk distributors, has si a four-year contract with Albrigh Wilson Ltd. to provide com national and some European distribu of phosphates. These are produce the chemical company at its Old site for use in detergents, industrial aners, flame retardant chemicals an edibles sector.

The £3m. ($4.7m) agreement ena Tankfreight to take over Albrigh Wilson's Oldbury-based road ta fleet. A gradual programme to rep many of the fleet's vehicles with ERF E10 tractors is currently un way.

Tankfreight has recently develop successful computerization progra and European network. It plans to in

ite management and computer links employ several of Albright & Wils former distribution personnel.

TEGRATED PS MAKERS FACE RGIN SQUEEZE

Far Eastern styrene prices continue to , adding to fears that integrated proers could face a squeeze on margins. ntracts for December lifting, Janudischarge, have been fixed at 50-660/ton cif Far East, compared to 30/ton cif Far East for November.

The two main contract suppliers are ell Canada, which has fixed 9,500 ton o Korea and 2,000 ton into Taiwan, d Sabic which is believed to have sold er 2,000 ton of styrene into Korea. terestingly, these prices have underned spot numbers, which were being oted at a range of $670-700/ton c & Far East.

The problem facing integrated procers is that polystyrene prices are falng away. In September, PS numbers ood at $900/ton c&f Far East, dropng to $820/ton c&f in October, and ow stand at $760/ton c&f Far East. ith Taiwanese PS being quoted at 750/ton fob and up to $630/ton c&f for onomer, it is generally accepted that argins are vastly diminished. If onomer prices continue to restrict argins, integrated producers in the Far ast are said to be considering lowerg capacities.

Several factors are behind the contiuing styrene hikes. One of the major asons cited by sellers is higher benene prices. In early October, European enzene prices stood at $380/ton fob WE, but by mid-November numbers d soared to $505/ton fob NWE. In the S, prices, which were relatively stable $1.25/gallon, showed gains of over 5 cents/gallon. Styrene producers have clared that sale prices should reflect e hike in feedstock costs.

Stronger demand from the Far East has helped to provide a motor for prices. Due to speculation on increased ABS production after the Lucky Chemicals production outage, Korea increased its purchases of material.

Japan has also been more active in the market than had previously been expected. A series of maintenance turnarounds are just being completed and this is limiting domestic supplies. Asahi has debottlenecked its Mizushima plant by 30,000 ton/year raising nameplate capacity to 400,000 ton/year.

Sumitomo has increased its output by a similar amount, giving it a nameplate capacity of 330,000 ton/year. Mitsubishi Petrochemicals recently completed maintenance work at its 170,000 ton/year Yokkaichi plant, while Idemitsu Petrochemical is in the throes of completing maintenance work at its 90,000 ton/year Tokuyana plant.

The shortage in domestic production due to outages has been made worse by strong derivative demand. According to PCI consultant Vince Sinclair, Japanese PS demand is running at 7 per cent higher this year, while low inventories are forcing the purchase of export product.

Traders had been playing an active role in the Far East market up until early November, but this has now diminished. Up to 12,000 ton of material appears to have passed through traders hands. The majority of export material is believed to have come from European producers looking for lower inventories. Prices of $580/ton fob Europe for export have been bandied about the market.

Traders have declared that Far East numbers range from $640-655/ton c&f Far East, with some sellers claiming as high as $685/ton c&f Far East. There is speculation that the Far East is still short, with buyers poised to enter the spot market.

The US contract market reflects the current perceived tightness in styrene. November styrene contracts were generally fixed at 32 cents/pound. December figures have been posted at 35-38 cents/pound, although some discounts are expected.

US PHOSPHATE OUTPUT HIKE

US production of marketable phosphate rock rose to 49.7m ton during crop year 1989, 1st July 1988 to 30th June 1989, an increase of 15 per cent over 1988 production, says the Bureau of Mines, US Department of the Interior.

The amount of marketable rock sold or used increased by approximately 8.9 per cent from 45.8m ton in 1988 to 49.9m ton in 1989. Apparent consumption during crop year 1989 was 42.3m ton, about 10.6 per cent more than the 1988 level of 38.3m ton.

According to statistics collected by the Bureau, phosphate rock exports for crop year 1989 amounted to 8.5m ton, an increase of about seven per cent on the 8m ton exported in crop year 1988. The Bureau of Mines says the value of exports has risen from $24.08/ton to $27.38/ton fob mine over the same period.

However, the US Bureau of the Census claims that phosphate rock exports for crop year 1989 represent 9m ton.

Excluding imports from Canada and Israel, as reported by the Bureau of the Census, the US imported approximately 970,000 ton of phosphate rock during crop year 1989, chiefly from Morocco. Imports from the Netherlands, Antilles and the rest of the world amounted to less than one per cent of the total.

ASIAN PLAYERS MULL PRICE DOWNTURN

A market glut could see the South East Asian petrochemicals industry

suffer low prices by the mid-n
the massive industry expans
rently being planned for the re
ahead.

At present 25 to 30 per cent
demands for several major pe
icals and polyolefins can be a
to South East Asia, and a si
amount of this is imported fr
where. Although there has
decline in Asian prices for pe
icals over the last year, countrie
the Pacific Rim evidently feel c
enough to plan a substantial ar
petrochemical development.

However, according to
Frank, president and managing
of Chem Systems, increases in
capacity levels, particularly in Ja
South Korea, could result in a
surplus of ethylene in the area. T
about 28 olefin complexes oper
South East Asia, 15 of which are
in Japan. Present capacity adde
of the planned facilities could br
ylene production to around 18.1
year by the mid 1990s, 4m t
above the projected South Eas
demand for 1995.

Frank observes that such a su
ethylene would have to be co
into derivatives. Moreover, if de
markets were unable to contain t
ply, these derivatives would t
exported to other countries in the

He claimed this process woul
in prices being set as low as ne
in order to move the product
might result in producers in are
high freight costs being unable t
pete and therefore being forced t
draw from the market.

Another problem could arise fr
anticipated shortage of naphtha. M
the olefins complexes in the reg
it as a feedstock and may find
selves in competition with gasoli
aromatics facilities for availabl
duct.

Biotechnology

UNVEILS VACCINE VANCE

esearchers at the Max-Planck-tut fur Biologie in Tubingin, West many, believe they have discovered chnique that will enable production designer vaccines." The scientists orted recently that a system of stim-ing cytotoxic T lymphocytes Ls), essential in the immune onse, as effectively as if they had n exposed to infectious viruses.

Normally, CTLs recognize fragments virus proteins so it was thought that thetic peptides could mimic this ponse. Researchers discovered, how-er, this approach does not work.

The West German group, led by Hans eorg Rammensee, claims to have und a way round this problem. By aching parts of an E.Coli protein to nthetic influenza virus peptides, CTLs ere effectively stimulated. "This tech-que shows particular promise in the sign of vaccines."

Nevertheless, Rammensee remains utious in his optimism claiming rther work on other viruses is required well as proof that it will work in mans. He believes the technique may extended to provide protection ainst non-viral pathogens such as alaria.

UROPEAN DRUG FIRMS TO OOL RESOURCES

Three medium-sized European drug mpanies, Merckle of West Germany, lfa-Schiapparelli of Italy and Lafon of rance, have agreed to pool resources develop and market products in the C after 1992.

The move should enable them to ompete more effectively with the large multinationals that are expected to benefit from the creation of the single European market. The three have total sales of $410/m/year.

SKB MOVE ON HEART DRUGS

Pharmaceutical Transnational Smith-Kline Beecham (SKB) is linking up with T Cell Sciences, a US medical diagnostics firm, to develop and market a drug used to limit heart attack damage. T Cell Sciences has licensed rights to the drug, complement inhibitor protein, from Johns Hopkins University in Baltimore.

Under the terms of the agreement, SKB will provide $10-12m for T Cell Sciences to conduct the remaining preclinical trials over the next 12 to 18 months.

Moreover, SKB will assume responsibility for the clinical trials and regulatory approval of the drug. In return, SKB will receive exclusive marketing rights worldwide with the exception of the US, Canada and Japan.

Complement inhibitor protein may prevent the damage to heart tissue that occurs following the restoration of blood flow after a heart attack. Initial studies have shown the drug to reduce significantly the extent of such tissue damage.

According to an SKB spokesman, the drug may also limit tissue death caused by other diseases including strokes, adult respiratory distress syndrome and autoimmune diseases. These may represent future targets for similar compounds.

Meanwhile, the US Food and Drug Administration has granted SKB a licence to manufacture and market the thrombolytic drug Eminase, following a review of the clinical trial results. The drug has been available in the UK since May 1989. Eminase is a blood clot dissolving drug used to treat heart attack victims.

WELLCOME TESTS NEW SUNSCREEN

Burroughs Wellcome is test marketing an innovative sunscreen which boasts of a broader spectrum of ultraviolet A and B absorption than existing products. If successful, it is expected to form the basis of a new range of otc products.

Most existing sunscreens are effective against UB-B radiation only. The new product, obtained under exclusive licence from Herbert Laboratories, a division of Allergan, contains avobenzone, a new chemical absorber effective against UV-A radiation. This is combined with the more conventional UV-B absorber, Padimate-O.

Because of the new chemical formulation, the sunscreen is believed to be the first in the US to have required approval from the US Food and Drug Administration.

CANADIAN DECLINE

Canadian production levels for most commodity chemicals and resins continue to decline, as the downturn in the industry which began towards the end of 1988 threatens to continue into 1990.

Although a few sections of the industry are still operating at close to capacity levels, there has been a substantial decrease in overall production utilization rates.

At 66,700 ton, August's production levels of low density polyethylene (ldPE) and linear low density polyethylene (lldPE) represented only slightly over 60 per cent of January's production levels.

Environment

UK CHEMICAL INDUSTRY WELCOMES "GREEN BILL"

The UK government's proposed environmental protection, or "green" bill, is expected to be published shortly. As outlined in the Queen's parliamentary opening speech, the bill is expected to contain the widest-ranging environmental legislation ever seen in the UK. For the chemical industry, attention focusses on three key aspects: integrated pollution control; reform of the waste disposal law; and control of the release of genetically manipulated organisms. The Bill will undoubtedly prove costly. Not withstanding, it has the backing, in principle, of the UK's Chemical Industry Association (CIA).

Of an expected 130 clauses, one-fifth are thought to relate to integrated pollution control. Under the far-reaching proposals, only one process consent will be required for all aspects of pollution, whether to air, water or land. Initially, because of resource funding, integrated pollution control will only apply to 10 per cent of all manufacturing sites. But this is expected to include all major UK chemical industry sites.

All new plants will be required to use BATNEEC (best available technology not entailing excessive costs) to limit emissions. All existing operations are likely to be brought under the same regime within five years. The CIA claims the measures will be the most stringent in the world and could lead to "severe rationalization."

In particular, the association voices concern for speciality chemical producers where protracted authorization procedures could result in commercial disadvantages. Moves are afoot to authorize the plant, rather than the specifics of the process. "It is a case of get ting something done quickly, then refining it," says the CIA. The Bill is likely to provide much greater public access to both the controls imposed and to data on the emissions actually occurring, so increasing the likelihood of independent enforcement of the controls. The CIA is supportive of information registers and better process descriptions to allow better appreciation of industry. But the association places emphasis on interpretation by regulators, rather than "swamping the system with raw data."

Reform of the waste disposal law is set to impose a "duty of care" on industry to select responsible disposal contractors. The main impact is likely to be a tightening up of the existing system of waste disposal licensing, and involvement of local authorities in waste disposal operations. Other issues to be addressed include a tightening up of import/export controls, and the problems of existing contamination of land, where clean up costs — as US Superfund experience has shown — can be enormous.

One of the more contentious aspects will be regulations on the deliberate release of genetically manipulated organisms into the environment. Special consents will be required from the secretary of state. The CIA is concerned that government resources will be insufficient to get authorizations through, possibly forcing production abroad. Despite its breadth and controversial nature, the Bill is expected to pass through the various committee stages early in the new year and receive Royal Assent in the summer months.

GREEN LIGHT FOR EC ENVIRONMENT AGENCY

Formation of the long-awaited European Environment Agency was agreed by the twelve EC member states recently. The agency could be functional by January 1991 if it gets rapid and final approval from the European parliament, the EC's environment commissioner Carlo Ripa di Meana said. The agency would be responsible for collecting and interpreting st dized environmental statistics fr member states. The information be used by the EC commission t blish environmental policy fo community. But the agency woul no enforcement powers.

Although no budget has yet fixed, the ministers agreed it wo financed by the EC's budge member countries. Several including Berlin and Copenhagen expressed interest in being host agency. Chris Patten, UK enviro secretary, said the UK was prop Cambridge for the headquarters ministers agreed the agency wo run by a 14-strong management consisting of a representative fron member state and two represent from the commission. It would have a nine-person scientific Many in the commission would mately like the agency to have a powerful role, more akin to that US Environmental Protection Ag

GERMANY TO END INCINERATION AT SEA

West Germany plans to end in ration of toxic waste at sea by th of 1991, three years ahead of the dule foreseen by the North Sea Co ence of 1987. The early phase-ou been necessitated by Belgium's re to renew for permission for Ge toxic waste to be burnt off the coa Antwerp. The permit, extended in for a further two years, expired in ber. The new timetable, agreed by federal states, the federal environm authority, the German hydrogr institute, the chemical industry ass tion and the chemical employees u is subject to the approval of at leas land-based incineration plants. In one-year period preceeding phase the chemical industry hopes waste posal firms will be allowed to us port of Emden in northern Germa an embarkation point for incinera trips.

News about new projects

MAY HAVE EDGE IN LAYSIAN PE PROJECT

P appears to have the inside track a pioneering $750m polyethylene) joint venture in Malaysia, though cal government official seems to e jumped the gun in saying so. A nber of other multinationals, inclu- Exxon, pitched for the plant, which be the first in the country to pro- e PE.

A BP spokesman said: "We have a ar understanding that we are invited participate. However we have not eived a formal commitment." The pacity has not been confirmed, the ss understands.

A 400-hectare site has been set aside the project on east-coast of Treng- nu state, according to state premier an Mokhtar Ahmad. Details of output re not immediately disclosed. The ention is to crack ethane supplied by state energy monopoly Petronas into ylene, which will be processed into h-density and linear low-density po- thylene.

Trengganu is the site of Malaysia's gest oilfield, accounting for the jority of the country's 560,000 bar- s/day and has substantial gas reserves. The plastics venture is intended to be in operation by 1993.

BP proposed the idea some time ago, touting its position as a world leader in polyethylene technology. Other approaches were made by as many as nine companies from the US, Japan and Taiwan, industry sources say.

The premier's announcement was refuted, shortly after it was made, by a federal government statement in Kuala Lumpur. The trade and industry ministry insisted no final decision has been made and that various proposals are still being considered. A decision is expected shortly, and "once it is approved the ministry will provide details."

Exxon proposed an $800m "world-class" plant for the Trengganu site in August 1988. Its plans called for an output of 450,000 ton/year of ethylene and a similar amount of polyethylene. Exxon's proposal included the formation of a 50:50 joint venture with Petronas. Much of the output would have been destined for export to the Asia-Pacific region.

BP has about $40m invested in Malaysia and says it intends to increase that by about $7m/year over the next few years, but most of its activity is in oil exploration.

The company's former Malaysian managing director, Stephen Pettit, said on departing in July last, that BP sees polyethylene as "a strategic business, and we see Malaysia as an interesting opportunity. Malaysia has competitive feedstocks. Geographically it is well placed in the region in terms of marketing. Overall, it is a good place to invest."

CIBA-GEIGY IN BRAZIL

Ciba-Geigy has approved a $150m investment programme to be carried out in Brazil over the next three years, this will increase the company's investment rate from $35m to $50m/year.

This year the group established new headquarters in Sao Paulo City and in 1992 plans to build a $10m, 8,000 ton/-year herbicides unit a Camacari, Bahia state.

Chairman Norbert Gmur also revealed plans for a $14m alkyl phenols unit which is scheduled for completion by 1992. Other plans include a series of minor expansions and debottleneckings.

BASF INVITES BIDS FOR ANT-WERP CRACKER

BASF has invited two contractors,

Linde and Technip/KTI, to consider undertaking the DM1.25bn ($671m) ethylene cracker project in Antwerp, Belgium. BASF has asked groups to come up with detailed engineering and turn-key lump sum offers. KTI seems to be taking an interest in the project, since two of its representatives in the Netherlands, Leo Visser and Frans Duim, were at BASF recently to discuss the proposals. Despite this, industry sources suggest that Linde is likely to emerge as the victor. The company is under orders from BASF to remain silent on the subject.

The ethylene cracker will start up late 1993 and will be up to full production, put at some 600,000 ton/year, in early 1994. Eventually all the production will be used by BASF for downstream production. However, before then some ethylene from the new plant will be available on the market.

PIC PLANS TO BOOST ITS PP PRODUCTION

Kuwait's Petrochemical Industries Company PIC is to boost polypropylene production at its Shuaiba plant by a further 20,000 ton/year to 100,000 ton/year. The plant is scheduled to go on stream in 1992/93. Meanwhile, PIC is reconsidering plans to revive its ethylene cracker at Shuaiba. The plant, which received approval in 1982, was cancelled later during the same year.

Sources confirm the company is seeking information from international companies, concerning petrochemical production technology. If the $2bn project goes ahead it is expected to manufacture at least 500,000 ton/year of polypropylene, ethylene glycol and styrene from semi-process natural gas and domestic refineries.

ELEKEIROZ TO BOOST SALES THROUGH $500M EXPANSION

Brazil's Elekeiroz, the chemicals holding company of Itausa, has detailed plans for a $500m investment, which is to take place over the next five years. Through the move the company hopes to increase its predicted $128m turnover for 1989 to some $400m-$500m from 1995 onwards.

Elekeiroz' chairman, Cezar Huidoro says, to date, $300m in investments have been identified and the group plans to continue its strategy of investing in large scale plants for technology added products.

The group will either invest in its two controlled companies, Productos Quimicos Elekeiroz and Elekeiroz de Nordeste, or through joint ventures. Included are plans for the 50/50 Ciek partnership, with Ciquine. The two companies, which have invested $168m on the Camacari-based project, which is turn includes a 20,000 ton/year maleic anhydride plant, will use Mitsubishi technology.

The plant is scheduled to go on stream in 1992 and is expected to be of a large enough capacity to meet the predicted Brazilian demand of 24,000 ton/-year. Another Ciek project, due on stream 1992 at a cost of $120m, will manufacture 25,000 ton/year of acrylic acid and 31,000 ton/year of acrylates.

Meanwhile, Huidoro says 1992 is clearly a decisive year for Elekeiroz as it is due to start up one of its most important projects.

At Camacari, plans are underway for Elekeiroz de Nordeste to build a complex for 80,000 ton/year butyraldehyde, 25,000 ton/year butanol and 35,000 ton/year of octanol.

PETKIM DEBOTTLENECKS PLANTS

Petkim, Turkey's state-owned petrochemicals company, has selected the firms which will conduct preliminary studies for the debottlenecking of eight units operated by its subsidiaries, Alpet and Yarpet. The companies invit participate in the $75m expansio those which were involved in the inal construction.

Dr. Faruk Yagiz, Petkim ge manager, said the press : "Petk intending to expand a number of p at both sites. Preparation of pr design packages are almost comp In some plants, the engineering tracts are already signed. Since t an expansion that covers several nical aspects, it was decided to co the original licensor and engine companies for each plant."

Simon Carves will be responsib raising the output of low density yethylene at Alpet from 175,000 year to 190,000 ton/year. Japan's M Petrochemical will increase hdP 60,000 ton/year from 44,000 ton/ Badger is to increase acrylon output to 92,000 ton/year from 77 ton/year; Solvay and CTIP are see to up PVC to 130,000 ton/year 105,000 ton/year, and VCM to 132 ton/year from the existing 120,000 year; Stone & Webster is raising ylene output to 400,000 ton/year 350,000 ton/year.

Capacity increases at Yarpet unlikely to be as dramatic. Finatech Litwin are to raise PS capacity s 6,000 ton/year to 24,000 ton/year, w ICI and Solvay are to expand the E unit's output to 62,000 ton/year f 47,000 ton/year.

BANAGAS MOVES ON PP, MT

Bahrain National Gas Co. (Bana is putting the finishing touches t $365m plan for world scale polypro lene and methyl tertiary butyl e facilities. The units will use LPG fe stock and, once approval is granted the government, could be operative 1992.

Chem Systems International completed a technoeconomic feasib

for Banagas looking at a number tions for the company. Banagas is cted to present its findings within ext few months to the Bahrain gov- nent for approval.

is envisaged that the plant will use ydrogenation technologies to pro- e polypropylene from propane and BE from butane. A number of com- ies are believed to have this tech- ogy, although the leaders are UOP Air Products. Indeed, the technolo- belonging to these two companies being evaluated by Himont, the rld's top PP producer.

No decision has yet been made on the acities of the plants although figures some 180,000 ton/year for MTBE 130,000 ton/year for PP have been ced.

With MTBE demand rising fast in the veloped world, it is likely the gaso- e additive will head west, while PP l head eastwards. Banagas is ieved to have contacted seven firms out prequalification for project man- ement consultancy.

LIN UNVEILS PLANS FOR SPE- ALITY UNIT

Olin Corporation has anounced it is build a new speciality isocyanates nt at its Lake Charles, Louisiana mplex. The plant is scheduled to go o operation by mid 1991 and will be igned to have a top capacity of 600 ton/year, and will use in-house nnology.

Olin has been producing speciality phatic isocyanates at a pilot plant at e Charles since January last and w aims to market and complement its existing yurethanes products.

The company's chemicals group sident and an Olin executive vice sident, Robert Yohe, said: "Based on success of our semi-works we have decided to speed up on plans for a full-scale facility. This will enable us to take advantage of the rapid growth in the automotive and industrial coatings markets, where we already enjoy a leading position."

The plant will produce hexamethylene diisocyanate (HDI) biuret and trimer, isophorone diisocyanate (IPDI), hydrogenated methylene diisocyanate (H12MDI) and octadecyl isocyanate (ODI).

The company currently supplies these from its semi-works, but believes a full scale US plant will provide an assured supply that is less susceptible to global fluctuations.

Olin is the second largest producer of TDI in the US and is a major supplier of speciality polyether polyols.

BRAZIL BOOSTS ACRYLATES CAPACITY

Brazil's capacity for production of acrylates has been boosted by Metacril's announcement that its $10m plant is to begin production of methyl and ethyl acrylate.

The Bahia-based company formerly produced 6,000 ton/year of the chemicals but lost this capacity after an explosion in December 1987. In the meantime, Metacril has had to use imports to satisfy some 40 per cent of a total domestic demand which has grown to around 12,000 ton/year.

The new plant will be able to produce up to 10,000 ton/year, and the company plans to invest a further $5m to double current production capacity. To achieve this, Metacril is depending on its supplier of acrylonitrile raw material, Acrinor-Acronitrila do Nordeste, to double its production to 150,000 ton/year by the end of 1991.

Oxiquimica, Metacril's rival, also plans to begin producing acrylates and acrylic acid. The joint venture between paints and varnishes producer, Renner Hermann and Oxiteno do Nordeste, received a $24m loan from the National Development Bank (BNDES) towards a $110m project aimed at producing 40,000 ton/year of acrylic acid and 43,000 ton/year of acrylates. The plant will be located at the Triunfo petrochemicals complex in Rio Grande do Sul, and use technology under licence from Mitsubishi.

At present, Brazil lacks acrylic acid capacity, although Ciek has been granted a licence to produce both this and acrylates at the Itaguai complex in the state of Rio de Janeiro.

AQUINO REMOVES PLANT OBSTACLES

The last of a series of obstacles has been removed, clearing the way for the Taiwan-backed petrochemicals project in the Philippines to get underway. The breakthrough came after Philippines president Corazon Aquino signed a law abolishing a 48 per cent tax on naphtha and the supreme court in Manila threw out objections to the project.

Meanwhile, Luzon Petrochemical Corp. (LPC) says construction on the $360m plant will commence in the first quarter of 1990. The cracker will have an output of 230,000 ton/year of ethylene, which will be converted into 140,000 ton/year of polyethylene and 110,000 ton/year of polypropylene, all of which is now imported by the Philippines.

LPC, which is 60 per cent owned by USI Far East Corporation, said its original partner, China General Plastics Corporation quit the venture a month ago due to continuous delays in starting the plant.

Meanwhile, USI Far East has been seeking new partners and confirmed that the International Finance Corporation has shown some interest in the project.

News from Japan

UBE JOINS SANKYO FOR DRUG DEVELOPMENT, CLINICAL TESTS

Ube Industries, Ltd. and Sankyo Company -- Japan's 2nd-largest drug maker -- have teamed up with each other for development of therapeutic products. Under the agreement, Ube will undertake synthesis of new substances such as drug ingredients and their manufacture in bulk, while Sankyo will carry out their clinical testing, formulation and marketing.

The first candidate as a drug covered by the agreement is an antihypertensive agent featuring a long period of action developed by Ube (code: CS-905). The agent has recently been put into clinical testing.

Behind this agreement is the coincidence of Ube's intention of advancing into drug business on a full scale and Sankyo's interest in expanding its lineup of new drugs. Under the agreement, Sankyo has begun clinical tests on the new agent. Sankyo will also advise Ube on potential substances as drug intermediates.

CS-905 is a dihydropyridene-based calcium antagonist having the mild effect of reducing blood pressure, with one oral dosage a day, for a longer period of time than in the case of conventional drugs. In addition, it has these advantages: (1) little effect on the renin-angiotensin system, (2) the action of expanding the cerebral and coronary arteries, and (3) good absorption of effective ingredient via oral administration.

The agreement calls for cooperative development of drugs related to three areas: (1) cardiovascular agents centered on antihypertensive agents, (2) cerebral-circulation ameliorants including antisenile-dementia agents and (3) anti-infectious disease agents including antibiotics and antibacterial agents.

For development of such drugs, Sankyo will offer Ube themes and Ube will carry out R&D work for synthesis of intermediates of potential drugs in line with Sankyo's proposal.

TOSOH AKZO TEAMS UP WITH FRENCH FIRM FOR ORGANIC-SYNTHESIS BUSINESS

In a bid to build up organic-synthesis/intermediates operations, Tosoh Akzo Corp. has tied up with PCAS (France) for mutual technical exchange. Based on the agreement, the Japanese company plans to study the feasibility of domestically producing PCAS products.

PCAS — affiliated with Akzo NV (Netherlands) -- is a special maker of organic intermediates for pharmaceuticals, agrochemicals, photochemicals and additives. The company has unique technologies in the organic-synthesis field.

Tosoh Akzo, inaugurated three years ago an organic metal-applied organic-synthetis/intermediates business. The company is engaged mainly in synthesis operations on a commission basis using a multipurpose plant for ultralow-temperature organic synthesis.

Organic metal-applied ultralow-temperature synthesis technology owned by the company features a high yield ratio and short process. Since it has a high level of selectivity in chemical reaction, it has attracted a lot of interest from the pharmaceutical/agrochemmical industries.

At the moment the company's main items are calcium hydrogenphosphate dibasic (abrasives for tooth paste) and catalysts for high-polymer production. The company envisages promoting the status of its organic-synthesis/intermediates operations to that third main business.

JSR SHELL ELASTOMER BU 20,000-T/Y TR PLANT

JSR Shell Elastomer (Head Tokyo; President: Vice-Presider suya Ueno of Japan Synthetic R Co.; capital: ¥1,500 million) enterprise of Shell Kosan K.K Japan Synthetic Rubber Co. -- constructing a mass production pl styrene thermoplastic elastomer (the Kashima plant of Japan Sy Rubber (Ibaraki Perfecture) in tember 1988. The new plant wa pleted recently. The new plant annual production capacity of tons. About ¥5 billion has been in in this plant's construction.

The new plant is an up-to-da representing the integration of th nological levels of the Shell gro Japan Synthetic Rubber. The fir anese plant built exclusively f production, is characterized by saving devices as a result of its tion of an overall system of co control. Polymerization was sta Sep. 1, 1989. After trial operatio several grades of guarantee oper had been conducted, productio started on a full scale in Octob

In addition, a research institu established at a cost of about ¥80 lion, so that users can be provide elaborate service. Consumption products in Japan remains at a level than that in European and ican countries. It is expecte demand will increase drastically after, along with the progress of

MITSUBISHI RAYON TO SE RESIN BASE FOR U.S. TON PRODUCTION

Mitsubishi Rayon Co. will sta duction of resin for toner in the States. It has decided to set up -- only its own funds -- a compa

duction and sale of acrylic coating n. According to the decision, mass-duction facilities will be built to go operation at the beginning of 1991. e production capacity will be 10,000 t/y, but the scale of the estment concerned has not been clar-ed. Mitsubishi Rayon aims at meet-g demand from Japanese manufactu-rs of toners, printers and duplicators o have advanced into the States. It also probing the possibility of selling products to American users, and ex-orting them to Europe and other areas well. The company is the second Jap-ese firm to start production of resin r toners in the United States, after Fu-kura Chemical Industries, and it is the rst to do so independently. It aims at ncreasing its sales to $20 million (app-oximately ¥2,800 million) by 1994.

The name of the new company is Dianal America." This company will e capitalized at $8 million (approxi-nately ¥1,120 million), solely by means f Mitsubishi Rayon's investment. The lant will be built in Texas, and such letails as the scale of the investment and he selection of the president will be letermined hereafter. The staff will be composed of a few more than 30 mem-ers at the beginning, and will be xpanded gradually later.

According to the present plan, the lant's construction will be started by une 1990 and it will turn out resin for oner (binder) and special acrylic resin for coating. The annual production capacity will range from 5,~10,000 tons, because products are diversified. The plant will go into full-scale operation at the beginning of 1991. Raw materials and equipment will both be procured in the United States, but some procure-ment will be concluded in Japan.

Products will be sold directly by the producer company and through trading firms as well. They will be supplied to Japanese manufacturers of toner, print-ers and duplicators operating in the United States. However, Mitsubishi Rayon is probing the possibility of supplying products to a wider range of circles, including American and European manufacturers, as the next step. It says that it has only been exporting products from Japan to the United States and Europe until now but that the establishment of production and sales bases in the United States will make it possible to stabilize supply and improve technological service drastically. The company aims at bringing new facilities into full operation within two years and taking the next step for expansion as early as possible.

Mitsubishi Rayon is one of the major manufacturers of acrylic coating resin, which uses methyl methacrylate (MMA) monomer as its principal starting material. This kind of resin is used as a raw material for a wide range of items, such as paint, ink, and adhesives. Japanese manufacturers of resin for toner form a group in the chemical industry circles concerned, together with Fujikura Chemical Industries, Sanyo Chemical Industries, and Mitsui Toatsu Chemicals. In the case of duplicators, Japanese manufacturers are dominant in most of the world market. As a result, the weight of overseas production is increasing rapidly. Accordingly, competition among manufacturers of resin for toner is stiffening throughout the world.

Fujikura Chemical Industries has built production facilities in the United States in co-operation with Rohm & Haas Co. Mitsui Toatsu Chemicals, too, has set up a sales company in the States, with a plan to start production in that country in a team-up with ICI Resin US. Mitsubishi Rayon is the second Japanese company to start resin production in the United States. It is the first, however, to advance into the United States independently. Its new resin enterprise in the United States will be the fifth enterprise of this kind after those of methyl methacrylate butadiene styrene (MBS) resin, biaxially oriented polypropylene (OPP) film, acrylonitrile butadiene styrene (ABS) resin, and high-class methacrylic ester.

SOLE MAKER OF POTASSIUM TITANATE WHISKERS COMPLETES NEW PLANT

Otsuka Chemical Co. has completed a 1,200 ton/year plant for potassium-titanate whiskers at its Tokushima factory and it will be put into regular operation by the end of the year. The plant is designed to produce either conventional-type whiskers ("Tismo D") or an improved version of the whiskers ("Tismo N").

Tismo N has a prominent advantage in that it is in an almost idea crystalline state and it has the molecular structure of "almost-pure" K_2O $6TiO_2$ resulting in a neutral pH state, whereas the conventional type of Tismo D contains such "impure" crystals as K_2O $4TiO_2$ and K_2 $8TiO_2$. The company says that the new type thus has a wider application range and will find new markets for use as a reinforcing material for fiber-reinforced metals and ceramics and super engineering plastics.

The completion of the new plant brings Otsuka's combined production capacity for potassium-titanate whiskers to 3,400 t/y. On the other hand, its joint venture -- Japan Whisker Co. --with Toho Titanium Co. and Mitsui & Co. has recently begun producing "Tofica" anti-abrasion material to be mixed with thermosetting resins.

DAIICHI TO INVEST ¥69 BILLION FOR DRUG R&D PLANT EXPANSION BY 1991.

Daiichi Pharmaceutical Co. has revealed its plan for equipment investment for a 3-year period including the current business term, reaching a total of ¥69 billion.

The plan aimed at streamlining its R&D setup and expanding production capacity in line with an increase in its

product range calls for investment of ¥23 billion for construction of new research wings at its laboratories in Tokyo, ¥20 billion in additional construction and improvement of new bulk-pharmaceutical facilities, ¥7 billion in construction of a distribution center and welfare facilities for employees, and ¥19 billion in subsidiaries.

Under the plan, the Tokyo research laboratories will be substantially expanded. A 14-storey central wing with a total floor space of 17,420 m² is now being built using an investment of ¥6.5 billion with completion slated for next fall. Information related to the company's clinical tests and R&D activities will be collected and processed there in future. Then ¥5 billion will be invested for construction of the No.9 research wing on the site of the Tokyo laboratories with completion scheduled for either the 1990 business year or the 1991 one.

Plant construction will be for "DR-3355" antibacterial agent (under phase-III) clinical tests and likely to be marketed in 1993) and "DP-1904" antiplatelet agent (under phase-II clinical tests and likely to be marketed in 1995). Construction is scheduled to start in 1990 for the former and in 1991 for the latter.

GUIDELINE FOR FOODS CONTAINING NUCLEOPROTEIN TO BE ESTABLISHED

Japan Health Food Association has started a working group within itself to map out a guideline for "nucleoprotein-contained products." Back of this is the increasing use in Japan of products containing nucleoproteins -- milt of fishes and beer yeasts, etc. -- in large amounts and acting as health-care food additives. The group will work out regulations for such products to be followed voluntarily by their makers with respect to the amount to be added to foodstuffs, and their processing conditions and extracting methods, etc., in order to specify "health-care foodstuffs containing nucleoproteins" for consumers' convenience.

Nucleoproteins are compound proteins consisting of nucleic acid linked to protein mostly found in the nuclei of living cells. In particular, they collectively occur in the milt of salmon and herrings and the testes of bovine, swine and chickens as well as beer and bread yeast. The working group consisting of experts from 11 leading Japanese food-additive makers is now considering specifying foods containing nucleoprotein and nucleic acid at a rate of more than 10% as "health-care foods.".

It is believed that nucleic acid and nucleoprotein act to rejuvenate the skin, prevent the hair from falling out and greying, prevent arteriosclerosis and hypertension, and improve the condition of those suffering from the after-effects of cerebral apoplexy and softening of the brain, etc.

ASAHI CHEMICAL TO ADVANCE INTO CLINICAL REAGENT BUSINESS

Asahi Chemical Industry Co. has decided to branch out into the clinical-reagent field on a full scale by the end of next year. It has already developed new monoclonal antibody reagents for detecting liver cancer and cirrhosis and has put them into clinical testing in Japan. It is also working on commercial development of a number of clinical reagents -- some for tumors in particular.

The company intends to take positive measures for full-fledged operations in this field by establishing partnerships with clinical-reagent makers in Japan and abroad as well as pushing M&A tactics aimed at Japanese and foreign firms. This plan is in line with the company's basic strategy aimed at becoming an all-around medical company involved with therapeutic products, medical instruments and clinical reagents. It is already implementing I work for drugs for adult diseases, cancer agents and antibiotic inter iates, while its subsidiary -- A Medical Co. -- is commercializing ificial organs and NMR (nu magnetic resonance) systems, etc

To expand its medical-related l nesses, the company is intent on inc ing capital investment in its affi Toyo Jozo Co. to strengthen the nership with it for R&D on and keting of diagnostic and therap products.

SHOWA DENKO'S JAPAN, U GRAPHITE PRODUCTION BA UNDER STABLE OPERATIO

Showa Denko's artificial-grap electrode plant in South Carolina, U.S. is operating smoothly, and a ance has been established with Omachi Plant in Japan. As a result original goal of keeping the export below the 50% level has been reali Profits, too, are showing a favor trend. Showa Denko Carbon's So Carolina Plant in the U.S. has bee full operation since July last year. A in the January~June period of this y the operation rate remained as hig more than 90%. It is expected that rate will remain at a similar level in July~December period of this yea well. The company has secured mar for its exports in Central and So America and Europe as well as in U.S. As a result, the Omachi Pl which is its production base in Jap has succeeded in expanding its prod tion to 40,~45,000 tons a year, rely mainly on domestic demand.

Until now the export ratio has b more than 60% in the case of the fir electrode business. However, it is s that a supply balance has been est lished between Japan and the U.S. a that it has become possible to exp that the ratio of exports from Japan w be reduced to the original goal of l than 50% on a stabilized basis.

New developments from Japan

MISING CURE FOR ALZ-MER DISEASE DEVELOPED: AI

sai Co. has developed and started ng an acetylcholine-esterase hE) inhibitor (code name: E2020) rded as a promising cure for Alz-er disease. Related research results announced at the second interna-l meeting on Alzheimer/Parkinson ases. The product will be subjected inical tests in the United States next .

he new agent has the piperidine-rochloride structure. On an invitro s, the company claims, it has higher ctivity for AChE than tetrahydro-no-acridine and physostigmine — under development in the States — e. In animal tests employing rats, the duct did not work on AChE exist-n peripheral nerves but inhibited the tions of AChE within the brain. The 20 concentration in the rat brain was to eight times higher than that in rat's blood. All these phenomena w that the product accumulates in brain and efficiently prohibit AChE tions.

he company intends to begin clin-tests on the new product in the U.S. Europe, where Alzheimer disease fe to a greater extent than in Japan. heimer disease is accompanied by ron breaks, amyloid deposition, dis-r of cholinergic neurons and trans-nation of Alzheimer fibrils, all of h are caused within the cerebral ex. Cures designed to correct dis-r of cholinergic neurons are being easingly developed all over the ld since substances capable of inhib-g AChE functions have produced reciable effects in the U.S.

C-FREE PRODUCTION THOD FOR URETHANE AM DEVELOPED

anyo Chemical Industries, Ltd. has developed polyether suitable production of low-hardness flexible polyurethane foam. In a hot-mold method, it is possible to process the new material into polyurethane foam - which has the same properties as those of conventional products - without using chlorofluorocarbon (CFC). The new product can be subjected to processing with existing hot-mold equipment.

Polyurethane foam produced from the new material has softness and cushioning properties, both of which are required for the seat backs of automobiles. The company is striving to pioneer other types of CFC-free polyether polyol used as raw material for HR foam and rigid polyurethane foam. It has hitherto commercialized various types of polyether polyol since it began to commercialize the product in 1961.

In Japan, annual demand for flexible polyurethane foam produced by means of a hot-mold process stands at roughly 50,000 tons and related demand for polyether polyol reaches about 33,000 tons. There is a worldwide need for CFC-free production of polyurethane foam in response to the campaign for eliminating CFC use.

There are two methods for eliminating CFC from a hot-mold process. One is aimed at accelerating foam production by increasing the use of water employed as a foaming agent, thereby producing polyurethane foam having low-level foam density and hardness.

The other is intended to accelerate foam production by raising the temperature of a mold when raw material is fed thereto, thus producing the abovementioned product.

Their drawbacks are, however, that the former is incapable of producing polyurethane foam with the desired hardness and the latter often produces cracks in the polyurethane foam thereby produced.

PRODUCTION FACILITIES FOR 8-INCH SILICON WAFERS LINED UP

Japan's semiconductor industry is aggressively pursuing increasing of the size of silicon wafers from six to eight inches, reflecting moves toward commercializing high-density chips having larger capacity than 16M-DRAM chips do. As a matter of fact, production facilities for 8-inch wafers have been put on the market one after another.

Kokusai Electric Co. is intent on marketing DJ-805J vertical-type CVD equipment suitable for production of 8-inch wafers. Tokyo Electron Ltd. is trying to catch up with Kokusai Electric by promoting sales of VDF-615 equipment.

With regard to CVD equipment, it is necessary to enlarge the diameter of furnace-core pipes. To this end, Toshiba Ceramics Co. has developed a quartz furnace-core pipe in expectation of demand increase for the product itself.

Etching equipment capable of forming smaller patterns on IC chips will grow in importance. Anelva Corp. and Sumitomo Metal Industries, Ltd. have provided ECR-6011 and ER5500 equipment, respectively, for use in commercial production of 8-inch wafers.

Stepper makers have not ignored the abovementioned moves. Nikon's NSR-177/5G7A equipment and Canon's FPA-1550/NiV-W equipment are usually applied to production of 6-inch wafers but are also usable for 8-inch wafers if they are partly modified.

Ulvac Corporation -- a major supplier of sputtering equipment -- has begun to market its MLX-30 equipment suitable for production of 8-inch wafers.

The line-up production facilities for 8-inch wafers has thus been enriched but there is still elbow room for further improving the yield ratio for the products. It will be interesting to see when domestic semiconductor makers introduce a production line for 8-inch wafers, since they are still cautious about starting their production.

NEW MATERIAL SAID TO PROVIDE ULTRAHIGH-LEVEL VACUUM STATE

National Research Institute for Metals has developed technology for producing hexagonal boron nitride (BN) on the surface of SUS304 stainless steel; it has thus regained confidence with regard to development of material for vacuum vessels, which provide an ultralow-pressure atmosphere (ultrahigh-level vacuum state) indispensable to "material art" -- technology for designing novel materials in accordance with user needs.

In the new technology, small pieces of boron nitride are placed on a plate of the said steel and high-frequency plasma is applied thereupon, thus producing thin film on the steel base: the film is then heated to 300°C in a vacuum so that it can uniformly cover the steel base.

Even when exposed to air for 24 hours, the film hardly adsorbs oxygen and carbon as is the case with BN film produced at higher temperature.

The institute claims that the technology will help coat the interior surface of conventional vacuum vessels with BN film, thereby making them usable under ultralow pressure.

The institute previously heated B/N-added SUS304 steel to 600°C, thus crystallizing BN film thereupon: the film also hardly adsorbs gas. This process, however, has the drawback that it reduces the strength of the steel base since the latter is heated to too high a temperature.

An ultrahigh-level vacuum state (pressure: below 10^{-11} Pa) is needed for creating ultrapure materials and studies are being conducted on how to develop material for vacuum vessels designed to neither adsorb nor discharge gas.

RESEARCHERS SEEK TO DEVELOP EXTREMELY TINY MECHANICAL DEVICE

Researchers at both the Mechanical Engineering Laboratory and the National Research Laboratory of Metrology will embark on the development of an extremely tiny machine with a volumetric measure approximately one-thousandth that of the smallest such device (several cubic centimeters) in use today. The dimensions of the machine's structural components, which will be measured in sub-millimeters, attest to its microscopic size.

The Mechanical Engineering Laboratory will approach the design by attempting to miniaturize existing techniques, while the National Research Laboratory of Metrology will reportedly apply electron beam exposure devices and related IC technologies to the endeavour.

Successful development of a submillimeter-sized machine could have a major impact on medical and space exploration innovation. In the medical field, for example, a device this size could be injected into the human body to collect tissue, destroy cancerous cells, or perform a carrier function by incorporation into a drug delivery system.

In attempting to engineer such a device by drastically scaling down existing manufacturing existing methods, the Mechanical Engineering Laboratory currently faces two research issues related to processing technology.

The first is to observe destruction and deterioration phenomena near ma surfaces during mechanical m processing and investigate the nece conditions for extremely fine micr chine processing.

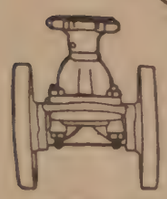
The second involves high- microscopic particle and ion-inje processing, examining the in-fligh dition of high-speed particles researching the distribution conc tion of injected ions. Through actions, the laboratory hopes to sub tiate the basic principles under micromachine creation.

With regard to structural techno the lab will examine miniature sl part lubrication from the perspecti microtribology and build a prot module suitable for transm extremely small motions. More researchers will conduct fluid co tion and nozzle tests in additi theory analysis in a basic test of m scopic fluid structures.

They will also carry out experin to confirm possible physical phe ena using a micro-actuator. Conce control technology, the lab will co dynamic analyses of basic mover in the control of miniature oper structures, and define problems necessary conditions for sensor m turization and integration.

Meanwhile, the National Res Laboratory of Metrology will en electron beam exposure devices other equipment currently used i manufacture of IC photomasks to out tests on micro-machine elem evaluate the accuracy of their cons tion and clarify the relationship bet engineering precision constru methodology and technology.

In addition, the lab will build a totype manufacturing device to co scientific measurements on m machine element characteristics in to provide the most suitable design ditions.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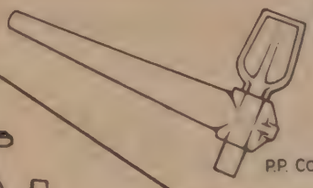
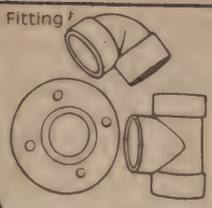
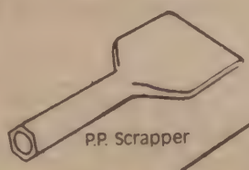

P.P. Cocks


Pipe Fitting


PP Filter Plate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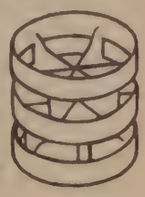
Pall Rings

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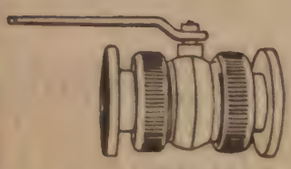
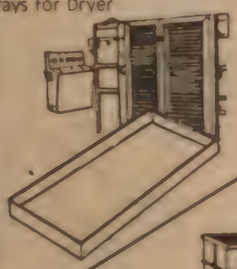

Ball Valve


Scrubber

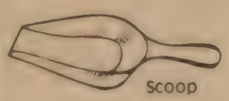

Exhaust System,

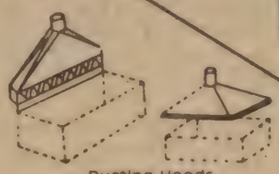
Trays for Dryer

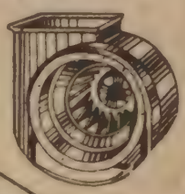



Tank


Tank


Scoop


Ducting Hoods


P.P. Centrifugal Exhaust Fans

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SCANOMAX INDIA LIMITED

OFFERS

BULK DRUGS & DRUG FORMULATIONS

AT REASONABLE PRICES

- 6 APA
- AMPICILLIN TRIHYDRATE I.P./B.P.
- ATENOLOL B.P.
- AMOXYCILLIN TRIHYDRATE I.P/B.P.
- CEPHALEXIN I.P.
- CLONIDINE I.P.
- MEBENDAZOLE I.P.
- GLIBENCLAMIDE I.P.
- PIROXICAM I.P.
- NIFEDEPINE I.P.
- IBUPROFEN I.P/B.P.
- CLOXACILLIN SODIUM I.P.
- FURSEMIDE I.P.
- CHLORAMPHENICOL I.P.

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CALCUTTA-700 071

MARKET INFORMATION

Ethanolamine Up

rices of mono ethanolamine shot by Rs. 15 per kg during the week der review due to fall in supplies well as a price hike by manufacers. Trading remained moderate d prices of most other chemicals nained stable. Caustic soda flakes was down slightly with easy availability of materials at Rs. 11 per kg. Butyl acrylate eased by Rs. 5 per kg ruling at Rs. 84 per kg during the week. Benzene was up slightly to Rs. 11.50 per kg and dye intermediates ruled static.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on January 2, 1990)

DUSTRIAL CHEMICALS	Per Kg.
mmonium sulphate	2.50
mmonium phosphate (Mono)	14.50
mmonium phosphate (Di)	14.00
mmonium carbonate (Di)	17.00
mmonium bicarbonate	5.60
mmonium chloride	4.00
mmonium nitrate	6.00
senic white powder	22.00
rylamide (Resale)	70.00
rium carbonate	6.00
eaching powder (33% Cl)	4.20
Borax (Granular)	19.00
Borax (Powder)	22.00
Boric acid (Tech)	26.00
Bisphenol-A	70.00
Butyl carbitol	110.00
Caustic soda (Flakes)	11.00
Caustic soda (Solid)	12.00
Caustic soda (Lye)	10.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
Calcium carbonate (Activated)	4.75
Cobalt oxide	300.00
Cresylic acid	62.00
Camphor (Indian)	105.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Belgium) (Resale)	47.00
Citric acid (Indian) (Resale)	47.00
Copper sulphate	25.00
Chromic acid	63.00
Ethylene urea	58.00
Ferric chloride (Lumps)	5.50
Ferric chloride (Anhydrous)	16.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17	110.00
Hydro	44+ST

Hyflosupercell	21.00
Hexamine (Resale)	35.00
Industrial Wax	25.00
Litharge	40.00
Lead Acetate (Tech.)	31.25
Lithopone	20.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	900+Ex+ST
Menthol bold	665+Ex+ST
Menthol crystal cold	700+Ex+ST
Magnesium carbonate (Japan)	16.00
Magnesium carbonate (Indian)	18.00
Maleic Anhydride (Resale)	40.00
Mercury (34.5 Kgs)	10,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	16.00
Peppermint oil (Rectified)	195+Ex+ST
Potassium carbonate (Indian)	34.00
Potassium carbonate (Imported)	33.00
Potassium bichromate	32.50+ST
Potassium phosphate (Mono)	14.00
Potassium phosphate (Di)	14.00
Polyvinyl alcohol (No. 117)	115.00
Polyvinyl alcohol (No. 173)	120.00
Polyvinyl alcohol (No. 208)	150.00
Paraformaldehyde (Resale)	23.00
Phthalic anhydride 36% (Resale)	24.25
Pentaerythritol (Resale)	45.00
Paraffin wax	19+ST
Rangolite (German)	90+ST
Rangolite (Czech.)	78+ST
Sodium sulphate (Fine)	6.00
Sodium sulphate (Coarse)	5.00
Sodium sulphide 50-52% (Flakes)	11+ST
Sodium sulphide 58-60% (Flakes) (TCL)	20.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	730.00
Sodium chlorite 80% (Spain)	85.00
Soda Ash (Tata)	4.80
Soda Ash (Birla)	4.50
Soda Ash (Imp.)	4.50
Sodium bicarbonate	7.50
Sodium bisulphite	4.50
Sodium silicate	3.00
Sodium acetate	5.00
Sodium alginate	320.00
Titanium Dioxide (Anatase)	80+ST
Titanium Dioxide (Rutile – RCR_2)	112+ST
Tartaric acid	100.00
Trisodium phosphate	5.50
Thiourea	86.00
Urea (Tech.)	2.90
Vacuum salt	1.00
Zinc Dust	32.00
Zinc Oxide	58.00
Zinc chloride powder (Tech.)	12.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	14.00
Acetic Anhydride (Resale)	35.00
Acetone (Resale)	20.50
Adipic Acid	70.00
Aceto Acetanilide	55.00
Aniline Oil	50.00
Benzoate Plasticiser	62.00
Butyl acrylate	84+ST
Butyl stearate	45.00
Butanol	35
Benzyl Alcohol	6
Benzyl Chloride	3
Benzo trichloride	1
Benzoyl chloride	2
Bromine Liquid	6
Chloroform	3
Carbon Tetrachloride	2
Cellosolve	5
Cyclohexanone	5
Cyclohexanol	58
Diacetone (Resale)	3
Diethyl Oxalate	3
Diethyl glycol (DEG)	3
Dioctyl Phthalate	4
Diallyl Phthalate	4
Dimethyl Phthalate	2
Dioctyl Adipate	5
Dibutyl Adipate	4
Dipentene	1
Dimethylamine 40%	2
Dimethylamine 50%	3
Ethyl Acetate	2
Ethyl Acrylate	7
Ethylene Dichloride	1
Ethylene Glycol	4
Formic Acid (Imp.)	2
Formaldehyde (Resale)	7
Glycerine (CP)	55
Glycerine (IW)	53
Hydrogen Peroxide 50% (Resale)	26
Isopropyl Alcohol	29
Isobutyl Alcohol (Resale)	30
Monoethanolamine (Resale)	95
Melamine	60
Methyl Ethyl Ketone	32+
Methyl Isobutyl Ketone	58
Methyl Acrylate	66
Methylene Dichloride (Resale)	16

Carbitol	60+ST
Meta Cresol	45.00
Nitrobenzene	25.00
Nitric Acid (Conc.) (RCF)	2.50
Ortho Cresol	30+ST
Phenol (Resale)	36.00
Propylene Glycol	55.00
Polyethylene Glycol (No.200)	58.00
Polyethylene Glycol (No.400)	68.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	70.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	110.00
Styrene Monomer	38+ST
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	29.00
Triethanolamine (Resale)	71.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	47.50

SOLVENTS	Per Litre
Benzene	11.50
N-Heptane	10.50
N-Hexane	13.00
Methanol	9.50
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	13.50
Xylene	18.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	63.00
Alpha Naphthol (Imp.)	185.00
Aceto Acetic Ester (Methyl)	64.00
Ammonium Molybdate	210.00
Anthraquinone	115.00
Anthranilic Acid	77.00
2-Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	255.00
Beta Naphthol (Atul)	72.00
Benzidine Dihydrochloride (BDH)	96.00
Bromamine Acid	600.00
BON Acid	130+Ex+Ta
Chicago Acid (Atul)	345.00
Coach Acid	55.00
C. Acid (Imp.)	210.00
Cyanuric Chloride	128.00
2,4- DNCB	30.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	70.00
Diethyl Aniline	165.00
Diamino stilbene disulphonic acid	165.00
3,3-DCB (Imp.)	180.00
Gamma Acid (Atul)	200.00
H. Acid (Atul)	120.00
G. Salt	75.00
Isophthalic Acid	45.00
J. Acid	355.00
J. Acid Urea	425.00
K. Acid	125.00
MPDS (German)	185.00

MNA	1
Meta Ureido Aniline	2
MPD (Local)	2
MPD (Japan)	2
Naphthenic Acid	
N-Methyl J. Acid	6
N-Methyl Aniline	1
Naphthalene (Refined)	
Ortho Anisidine (OA) (Imp.)	1
Ortho Dichloro Benzene (ODCB)	
OT Base	13
Para Dichloro Benzene (PDCB)	3
Para Anisidine (PA local)	15
PNA	11
Para Cresidine (Imp.)	41
Para Amino Azo Benzene (India)	17
PNCB	6
Para Amino Acetanilide	19
1-Phenyl 3-Methyl 5-Pyrazolone	15
Phenyl J. Acid	35
Para Amino Benzoic Acid	13
PT Base	15
Rhoduline Acid	55
Resist Salt 80%	2
Resorcinol	21
Sodium Naphthionate	67
5-Sulpho-Anthranilic Acid	82
Sulphanilic Acid	41
Sulpho Tobias Acid	170
Trichloro Benzene (TCB)	22
Tobias Acid	165
Metanilic Acid	43
MTD	120

Delhi Market

DELHI: DEC. 29, (NNS) Caustic soda flakes suffered a set back and slumped by Rs. 30 at Rs. 475 per 50 kg in the Delhi chemicals market during last week, in view of accumulation of stock in market as well as fall in demand by consumers. Export demand was also negligible while stock and supply position was satisfactory. Soda ash drifted lower by Rs. 3/4 at Rs. 340/346 thanks to better supply and poor offtake. Soda bicarb ruled easy at Rs. 290/295 per katta.

As a result of negligible demand by consumers as well as comfortable stock position in the market, chatkolite, sufolite and rangolite Germany dropped by Rs. 2 each at Rs. 64, Rs. 75 and Rs. 85 per kg respectively. It is noticeable that a fall of Rs. 15 was reported in its prices within a month. In the absence of demand from gur manufacturers due to heavy mist and severe winter, sodium hydrosulphite ruled quiet at its previous level of Rs. 34/36.50.

Tartaric acid France declined further by Rs. 10 at Rs. 13,700 per 50 kg in the absence of demand while tartaric acid Indian ruled quiet at Rs. 4,150 per 15 kg. In the absence of arrivals from Sambhol, Muradabad, Rampur, Amroha and Chandausi areas of U.P. as well as sustained demand by exporters, menthol medium and bold pushed up by Rs. 25/30 at Rs. 385 and Rs. 400 per kg. Menthol flake also advanced from Rs. 330 to Rs. 358 per kg in view of dwindling stock position. As a result of sustained demand from stockists and exporters, menthol oil looked up by Rs. 20 at Rs. 265/285. DMO moved up by Rs. 2 at Rs. 122.

Slack wax suffered a fall of Rs. 100 at Rs. 8,400 per tonne for want of support while paraffin wax remained quiet at Rs. 880 per 50 kg. Naphthalene balls being offered lower at Rs. 1,500 against Rs. 1,525 due to lack of buying interest. In the absence of demand from plastic and paint units, prices of titanium dioxide ruled easy at its last week levels. Demand was poor in dyes and colours due to severe winter.

(DELHI MARKET RATES AS ON DECEMBER 29, 1989)

Ammonia Bicarb (Per 25 Kg.)	140.00
Mercury (Per flask)	10,700.00
Soda ash (Per bag)	340/346.00
Ammonium Chloride (50 Kg.)	110/180.00
Caustic soda flakes (50 Kg.)	475.00
Citric acid (Per 50 Kg.)	2,150/2,375.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	100.00
Stable Bleaching Powder KCl (Per 25 Kg.)	90.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	90.00
Stable Bleaching Powder Modi (Per 25 Kg.)	92.00
Sodium Bicarbonate (50 Kg.)	290/295.00
Sodium Hydrosulphite (Per Kg.)	34.00/36.50
Rangolite (Per Kg.)	85.00
Tartaric acid (Imp) (50 Kg.)	13,700.00
Sufolite (per Kg.)	75.00
Chatkolite (per Kg.)	64.00
DMO	122.00
Boric acid Technical (Per 50 Kg.)	1,400.00
Paraffin Wax (Per 50 Kg.)	880.00
Tartaric Acid (Trishul Per 15 Kg.)	4,150.00
Borax Granular (Per 50 Kg.)	835.00
Borax Crystal (Per 50 Kg.)	835.00
Sodium Nitrite (Per 50 Kg.)	800/900.00
Sodium Nitrate (Per 50 Kg.)	450.00
Camphor Thal (Per Kg.)	103.00
Camphor Powder (Per Kg.)	93.00
Menthol Bold (Per Kg.)	400.00
Menthol Medium (Per Kg.)	385.00
Menthol Flake (Per Kg.)	
Glycerine (Per Kg.)	55
Sodium Silicate (Per quintal)	265/
Hexamine (Per Kg.)	
Acetic Acid Glacial (Per Kg.)	
Copper Sulphate (Per quintal)	2,400
Formic Acid (Per Kg.)	
Formaldehyde (Per Kg.)	
Hydrogen Peroxide (Per Kg.)	26
Calcium Carbonate (Per Tonne)	2,500
Acid Slurry Soft (Per Kg.)	
Acid Slurry Hard (Per Kg.)	
Phosphoric Acid (Per 50 Kg.)	1,0
Potassium Nitrate (Per quintal)	900/1,2
Potassium Permanganate (Per 50 Kg.)	2,800/3,2
Sodium Bichromate (Per 50 Kg.)	1,575/1,6
Trisodium Phosphate (50 Kg.)	6
Titanium Dioxide Anatase (Per Kg.)	
Titanium Dioxide RC-822 (Per Kg.)	
Titanium Dioxide K-Brand (Per Kg.)	
Titanium Dioxide RCR-2 (Per Kg.)	1
Zinc Oxide (Per metric tonne)	42,000/52,0
Phenol Carbolic Acid (Per Kg.)	3
Carbon Tetrachloride (Per Kg.)	2
Chloroform (Per Kg.)	2
Sodium Sulphate (Per metric tonne)	3,200/3,7
Naphthalene Balls (Per 50 Kg.)	1,5

DYES & COLOURS	(Per
Naphthol AS	175/20
Naphthol ASG	180/29
Naphthol ASBS	210/24
Naphthol ASTR	275/36
Naphthol ASOL	210/23
Naphthol ASBO	195/26

DIRECT DYES	(Per
Black E. Conc.	120/17
Diazo Black B.T.	105/14
Green B	90/14
Blue 2-B	60/10
Blue 2-B 225% (JNR)	12
Sky Blue FB	160/23
Basic Auramine	55/11
Basic Rhodamine	300/42
Basic Methylene Blue	100/18
Basic Violet	165/21
Basic Malachite Green	17
Acid Orange	75/11
Congo Red H/C	75/12

Madras Market

he year 1989 has ended with a er dull note. The year that had ed has been a year of mixed for- es. There has not been much of tuations of prices but the con- nption pattern in the south has n changing and there was a ady increase in the consumption. nil Nadu is emerging out as a or producer of petrochemicals in country and a number of major ustries have come up/coming up Manali Region, Madras.

lotable among the new units that expected to go on stream in the t three to four months are Manali rochemicals & U.B. Petrochem- s producing propylene glycol and yols, Cetex Petrochemicals manufacturing MEK, Balmer Lawrie producing butylated hydroxy toluene and para tertiary butyl phenol, Kothari Sugars & Chemicals producing poly-butadiene based lubricants, Indian Additives Ltd. a subsidiary of MRL going for manufacture of speciality lubricants and so on. The outlook for the coming year is bright.

As for prices during the last week acetic acid prices came down further while there was a shortage of acetic anhydride. There has been no change in caustic soda prices. Large consignments of imported solvents especially methylene chloride, methanol, isopropanol, diethylene glycol have come forcing the indigenous prices down.

(MADRAS MARKET RATES AS ON DECEMBER 30, 1989)

ic Acid Glacial (per kg)	15.00
ninium Sulphate Iron free er MT)	4,000.00
nonium Bicarbonate er 25 kgs)	140.00
nonium Chloride (per MT)	3,000.00
Slurry (per kg)	30.00
um Carbonate (per kg)	8.50
m Chloride (per kg)	8.00
: Acid Technical (per kg)	22.00
ching Powder (per 50 kgs)	225.00
x (per 50 kgs)	750.00
tic Soda Flakes – Mettur emicals (per MT)	10,800.00
tic Soda Flakes – Andhra gars (per MT)	10,800.00
um Chloride 70% Solid er MT)	3,000.00
um Chloride Anhydrous er MT)	5,750.00
um Carbonate (Activated) er MT)	6,000.00
Calcium Carbonate (Precipitated) (per MT)	5,000.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	24.00
Cresylic Acid 98-99% (per kg)	130.00
Pure Para Cresol 96% (per kg)	85.00
Meta Para Cresol 42% (per kg)	50.00
Formic Acid (per kg)	26.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine I.W. (per kg)	51.00
Hydrosulphite of Soda (TCPL) (per kg)	37.00
Hydrosulphite of Soda (IDI) (per kg)	42.00
Hydrosulphite of Soda (BASF) (per kg)	42.00
Hexamine (per kg)	30.00
Hyflosupercell (per kg)	20.00
Hydrogen Peroxide (per kg)	31.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	19.00
Magnesium Chloride (per kg)	3.50
Maleic Anhydride (per kg)	40.00
Menthol Crystals (per kg)	345.00
Oxalic Acid (per kg)	20.00
Paraffin Wax (per kg)	18.00
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	25.00
Polyvinyl Alcohol Powder (per kg)	130.00
Pentaerythritol (per kg)	50.00
Phthalic Anhydride (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	352.00
Soda Ash (TATA) (per 75 kgs)	352.00
Sodium Bicarbonate (TATA) (per 50 kgs)	370.00
Sodium Silicate (per MT)	3,500.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	14.00
Sodium Bisulphite (per kg)	4.50
Sodium Alginate (per kg)	225.00
Sodium Acetate (per kg)	7.00
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	75.00
Titanium Dioxide (Rutile) (per kg)	82.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	54.00
Zinc Chloride Powder (per kg)	12.00
Zinc Sulphate (per kg)	7.00

SOLVENTS

Acetone -- HOCL (per kg)	21.00
Butanol (per kg)	36.00
Butyl Acetate (per kg)	42.00
Benzene (per lit)	14.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	24.00
Chloroform (per kg)	29.00
Diacetone Alcohol (per kg)	30.00
Diethylene Glycol (per kg)	42.00
Dichloroethane (per kg)	18.00
Di-octyl Phthalate (per kg)	46.00
Di-N-butyl Phthalate (per kg)	48.00
Ethyl Acetate (per kg)	22.00
Isopropyl Alcohol (per kg)	28.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	23.00
Methyl Ethyl Ketone (per kg)	36.00
Methyl Isobutyl Ketone (per kg)	42.00
Phenol (per kg)	36.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	64.00
Trichloroethylene (per kg)	26.00
1-1-1 Trichloroethane (per kg)	29.00
Turpentine (per lit)	16.50
Toluene (per lit)	17.00
Xylene (per lit)	25.00

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
Eagle Star	F.F.C. Co.	Jeddah; P. Sudan; Hodeidah. (Carting at Timber Pond No. 1).	12/1
Bravo Sif (Dan)(V-620)	Marine Trans/	Antwerp; Rotterdam; Hamburg; Bremen; Le Havre; Felixstowe; Hull; Rostock; London; Liverpool; Avonmouth; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Helsinki; Malmao; Norkopping; Helsingburg; (including inland destinations for above ports); Lattakia; Limmasol; Izmir; Mersin; Istanbul; Beirut; Marseilles; Valencia; P. Said; Casablanca; Alexandria; Piraeus; Loloniki; Iraqi Ports. (Carting at T.P. No. 3).	10/1
	Khemka/	Larnaca; Mersin; Izmir; Casablanca; Genoa; Lattakia; Alexandria; Istanbul; Los Palmas & Teneriffe; Antwerp; Rotterdam; Hamburg; Bremen; Gdansk; Le Havre; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Malmao; Helsingburg; Helsinki; Kotka. (Carting at Wadi Bunder No. 3).	
	M.C.S./	Jeddah; Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Gdynia; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo. (Carting at H.B. No. 4).	
	Ranadip/	Jeddah; Palermo; Naples; Livorno; (Leghorn); Marseilles (Fos); Genoa; Barcelona; Bilbao; Valencia; Alicante; Algiers; Lisbon; Leixoes; Bremerhaven; Le Havre; Antwerp; Rotterdam; Bremen; Hamburg; Aarhus; Pireus; Gothenburg; Oslo; Copenhagen; Stockholm; Helsinki; Felixstowe; Tilbury; London; Avonmouth; Dublin; Belfast; Grangemouth; Liverpool; Manchester. (Carting at M.O.D. No. 3).	
	Arebee	Alexandira; Piraeus; Venice; Trieste; Koper; Naples; Fos; Barcelona; Valencia; Livorno; Las Palmas; Limmasol; Constanza; Budapest. (Carting at M-Jetha C.D.).	
Tilia	U.L.A.	P. Sudan; Aden; Djibouti; Hodeidah. (Carting at 14-VD for containers).	11/1
Integra	P & O	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).	10/1
Uni Pioneer (V-020)(Pan)	Greenways	Hamburg; Felixstowe; Rotterdam; Antwerp; Le Havre; London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wemble; Birmingham; Leeds; Leicester; Amsterdam; Bremen; Copenhagen; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast and all destinations in U.K.; Germany; Switzerland and Austria. (Carting at G/H Cotton Depot).	10/1
Archimedes (Nhava Sheva)	Patvolk/ S.W. & Co./ Trident/ P&O	Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles; Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at Kalamboli for all).	10/1
Vishva Parimal (Ind)	S.C.I.	P. Said; Felixstowe; Hamburg; Rotterdam; Antwerp; Bremen; Liverpool; Le Havre; Manchester; Avonmouth; London; Belfast; Aarhus; Oslo; Copenhagen; Gothenburg; Helsinki and all inland destinations. (Carting at T.P. No.1).	13/1
CMB Plantin	C.M.B.	Djibouti; Port Sudan; Jeddah; La Spezia; Valencia; Genoa; Barcelona; Marseilles; Tunis; Casablanca; Tangier; Alexandria; Piraeus; Mersin; Limassol; Felixstowe; London; Liverpool; Manchester; Birmingham; Avonmouth; Dublin and all inland destinations in U.K.; Antwerp; Rotterdam; Hamburg; Bremen; Leixoes; Lisbon; Copenhagen; Oslo; Gothenburg; Stockholm; Malmao; Aarhus; Helsinki. (Carting at Kalamboli)	14/1
Orient Express (Pan)(V-107)	Transworld	Hodeidah; Djibouti; Port Sudan; Jeddah; Assab; Masawa; La Spezia; Naples; Malta; Beirut; Tartous; Mersin; Marseilles; Genoa; Valencia; Fos; Leghorn; Tilbury; London; Liverpool; Avonmouth; Birmingham; Manchester; Leeds; Dublin; Belfast; Antwerp; Hamburg; Bremen; Rotterdam; Le Havre; Aarhus; Gothenburg; Helsinburg. (Carting at CFS Cotton Avenue).	13/1

(1)	(2)	(3)	(4)	
12/1	Green Valley	M.S.P.L.	Aqaba; Assab; P. Suez; (Alexandria). Carting at P/Q-PD).	
12/1	Yulius Fuchik (Rus) (V-105 W/B)	Transocean	Odessa; Izmail; Reni (U.S.S.R); Russe; Bulgaria; Budapest (Hungary); Linz; Vienna (Austria); Bratislava (Czechoslovakia); Deggendorff; Regensborg (West Germany). (All ports on River Danube). (Carting at N/O-PD & G-PD).	
14/1	Buzet (Yug)	Oceanic	P. Said; Rijeka; Med. Ports. (FCL only).	
2/1	Eagle Star	F.F.C.Co.	Colombo; Rangoon. (Carting at Timber Pond No. 1).	
6/1	Uni Pioneer	Greenways	Colombo. (Carting at G/H Cotton Depot).	
8/1	Together	Sitara	Karachi (Afghanistan)	
7/1	Eagle Star (V-025)(Cyp)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta. (T. Priok); Hongkong; Manila; Busan; Keelung; Kaohsiung; Kobe; Yokohama; Nagoya; Osaka; Tokyo; Tsingtao; Dairen; Quangzhou; Whampoa; Shanghai; Hsingkang. (Carting at Timber Pond No. 1).	
5/1	Bravo Sif	Marine Trans/	Singapore; Hongkong; Busan; Kobe; Tokyo; Djakarta. (Carting at T.P. No. 3).	
		M.C.S./	Far East & Japan Ports. (Carting at H.B. No. 4).	
		Ranadip/	Far East & Japan Ports. (Carting at M.O.D. No. 3).	
		Khemka	Singapore; Hongkong; Busan; Tokyo; Kobe. (Carting at W.B. No. 3).	
6/1	Uni Pioneer (V-020)(Pan)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Mozi; Nagoya; Pusan; Hongkong. (Carting at G/H Cotton Depot).	
10/1	Premier	P&O/I.M.E./ Killick)	Singapore. (Carting at W.B. No. 3 for I.M.E.) (Carting at M-178/180 C.D. for Killick) (Carting at T.P. No. 4 for P&O).	
10/1	Orient Express (V-107)	Transworld/	P. Kelang; Penang; Keelung; Kaohsiung; Busan; Bangkok; Kobe; Manila; Djakarta. (Carting at CFS Cotton Avenue).	
		N.L.S.	Far East; Japan and Chinese ports. (Carting at T.P. No. 4).	
10/1	Maribor (Yug)	Depe	Hongkong; Keelung; (Kaohsiung); Kobe; Yokohama; Tokyo; Busan. (Carting at CFS Cotton Avenue for Containers only).	
12/1	Green Valley	M.S.P.L.	Singapore. (Carting at P/Q-PD).	
7/1	Eagle Star	F.F.C.Co.	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Ctg. at T.P. No. 1).	
5/1	Bravo Sif	M.C.S.	Sydney; Melbourne; Brisbane; Burnie; New Castle. (Carting at H.B. No. 4)	
10/1	Premier (V-04)(Phi)	I.M.E./	Sydney; Melbourne; Adelaide; Fremantle; Brisbane; Auckland; Wellington; Lyttelton. (Carting at Wadi Bunder No. 3).	
		P&O/ Killick	Melbourne; Sydney; Brisbane; Adelaide; Fremantle; P. Hobart; Devon P. Launcheston; Burnie; P. Chalmers; Lyttelton; Christchurch; Dunedin; New Plymouth; Auckland; Wellington; Napier also Western Samoa; Papua; New Guinea; Solomon Island; American Samoa; Tonga; New Caledonia; Rabaul; P. Villa. (Carting at T.P. No. 4 for P&O) (Carting at M-178/180 Cotton Depot for Killick).	
7/1	Eagle Star (V-025)	F.F.C.Co.	Dubai; Sharjah; Abu Dhabi; Doha; Muscat; Dammam; Riyadh; Bahrain; Kuwait. (Carting at Timber Pond No.1).	
6/1	Al Zahraa (Iraq)	Al Rafidain	Umm Qaser. (Carting at 12-VD).	
5/1	Bravo Sif (V-620)	Ranadip	Dubai; Muscat; Abu Dhabi; Doha; Dammam; Bahrain; Kuwait. (Carting at M.O.D. No. 3).	
6/1	Tilia (V-62) (Cyp)	U.L.A.	Dubai; Dammam; Kuwait; Bahrain; Riyadh; Abu Dhabi; Doha. (Carting at 14-VD for Containers).	
10/1	Hafez (Iran)	J.M. Baxi	Bandar Abbas	
10/1	Orient Express (V-107)(Pan)	Transworld/	Sharjah; Dubai; Abu Dhabi; Ajman; Doha; Kuwait; Dammam; Baghdad/ Basrah; Syria and inland destinations in Gulf. (Carting at CFS Cotton Avenue).	
		O.S.A.	Dubai; Abu Dhabi; Bahrain; Doha; Muscat; Kuwait; Dammam. (Carting at M-178/180 Cotton Depot).	
6/1	Integra (V-14) (Pan)	Arebee/	Dar Es Salaam & Mombasa (Direct); Kampala; Jinja; Toronto; Lugazi; Entebee (Uganda); Kigali; (Rwanda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Zanzibar. (Crtg. at M.J.C.D.).	
		P&O	Mombasa; Dar Es Salaam (Direct); Beira; Mahe and inland destinations in East Africa. (Carting at Timber Pond No. 4).	
7/1	Eagle Star (V-025)	F.F.C.Co.	Los Angeles (Harbour); Longbeach; San Francisco; Oakland; Seattle; Vancouver (B.C.); Portland; New York; Boston; Norfolk; Baltimore; Charleston; Savannah; Miami; New Orleans; Houston; Montreal; Toronto; Fortworth; Chicago; Nashville; Atlanta; Philadelphia; Milwaukee; Kansas City; Phoenix; Guam; Dallas; Cleveland;	

(2)	(3)	(4)	(5)
		St. Louis; Cincinnati; Denver; Louisville; Memphis; Wilmington (B.C.); San Diego; Minneapolis; Indianapolis and Central American Ports; Honolulu. (Carting at Timber Pond No.1).	
Bravo Sif (Voy-620)	Marine Trans/	Boston; NewYork; Baltimore; Norfolk; Charleston; Port Everglades; Jacksonville; Galveston; Houston; Los Angeles; Toronto; Montreal; Philadelphia; Savannah; New Orleans; South and Central American Ports. (Carting at T.P. No. 3).	10/1
	M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Galveston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; Tampa; New Orleans; Providence; San Diego; Oakland; San Francisco; Stockton; Chicago; Detroit; Cleveland; Milwaukee; Columbus; Kansas City; Atlanta; Nashville; Dallas; Minneapolis. (Carting at Hay Bunder No. 4).	
	Ranadip	New York; (Elisabeth); Portsmouth (Norfolk); Baltimore; Charleston; Boston; Philadelphia; Houston; New Orleans; Jacksonville; Savannah; Wilmington (N.C.); Mobile; P. Everglades; (Miami); Los Angeles; (Longbeach); Oakland; Portland; Seattle; Anchorage; Montreal; Qubec; Ontario; Toronto; Via Halifax; Vancouver; Detroit. Also Caribbean & Mexican Ports. (Carting at M.O.D. No. 3).	
Uni Pioneer (Voy-020)	Greenways	New York; Newark; Baltimore; Charleston, New Orleans; Houston; Boston; Providence; (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; Sanfrancisco; Oakland; San Diego; Stockton; Richmond; Almeida; Redwood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas; Various inland destinations and Caribbean Ports. (Carting at G/H Cotton Depot).	10/1
Archimedes (Nhava Sheva)	Patvolk/P&O S.W. & Co./ Trident	S. American Ports. (Carting at Kalamboli for all).	10/1
		New York; Norfolk; Savannah; Baltimore; Boston; Charleston; Houston.	
Vishva Parimal (Ind)	S.C.I.	New York; Baltimore; Savannah (Direct) and other inland destinations (Carting at Timber Pond No. 1).	13/1
CMB Plantin	C.M.B.	Norfolk; New York; Baltimore; Philadelphia; Charleston; Savannah; Houston; Miami; New Orleans; Via Antwerp; Montreal; Toronto; Halifax. (Carting at Kalamboli).	14/1
Premier	Killick	S. American Ports. (Carting at M-178/180 Cotton Depot).	13/1
Hoegh Cairn	Patvolk	Montreal & Toronto via Halifax; New York; Boston; Norfolk; Charleston; Houston; Savannah; Wilmington; Philadelphia; Baltimore; New Orleans; & FCL Chicago; Milwaukee; Atlanta; Dallas. (Carting at H.B. No. 5).	14/1
Orient Express (Voy-107)	Transworld	Los Angeles; Longbeach; Sanfrancisco; Oakland; Seattle; Vancouver; New York; Boston; Toronto; Montreal; Philadelphia; Norfolk; Baltimore; Charleston; Savannah; Jacksonville; Miami; New Orleans; Houston. (Carting at CFS Cotton Avenue).	13/1
Green Valley (AME)	M.S.P.L.	Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	13/1
Buzet	Oceanic	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston and other inland destinations in U.S. East Coast and S. American Ports. (Carting at Wadi Bunder No. 3).	16/1
Great Universe (V-101W)	Arebee	Lagos/Aqapa; P. Harcourt; Abidjan; Tema; Takoradi; Monrovia; Lome; Freetown; Cotonou; Douala; Matadi. (Carting M-Jetha Cotton Depot).	10/1
Archimedes (Nhava Sheva)	Patvolk/P&O/ S.W.& Co.	West African Ports. (Carting at Kalamboli for all).	10/1
CMB Plantin	C.M.B.	Lagos; Abidjan; Lome; Douala; Matadi; Port Gentil; Pointe Noire; Nouakchott; Cotonou; Dakar; Luanda; Monrovia; Tema via Antwerp. (Carting at Kalamboli).	14/1
Orient Express (V-107)	Transworld	Monrovia; Lome; Lagos; Douala; Tema; Takoradi; Abidjan; San Pedro. (Carting at CFS Cotton Avenue).	13/1

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
13/1	Algerian Express	F.F.C. Co.	U.A.E.
14/1	Buzet	Oceanic	USA/Adriatic
17/1	CMB Enterprise (Nhava Sheva)	C.M.B.	U.K. Cont./U.S. Med./E. Af
12/1	CMB Plantin (Nhava Sheva)	C.M.B.	U.K. Cont./U.S. Med. Ports
12/1	Green Valley	M.S.P.L.	U.S.A.
10/1	Hoegh Cairn	Patvolk	U.S.A.
16/1	Ind. Faith	I.S.S.Co.	U.K. Cont.
15/1	Jag Yamuna	I.S.S.Co.	U.K. Cont.
10/1	Maribor	Depe	Far East
10/1	Olandia	Merzario/Samrat	U.K. Cont.
13/1	Vishva Yash	S.C.I.	U.K. Cont.
12/1	Yulius Fuchik (V-015)	Transocean	Russia/E. Europe

Materials Imported

PLASTIC MATERIALS IMPORTED BOMBAY (From 10.11.89 to 15.11.89)

HDPE: From Czechoslovakia: rdik Inds. Corpn., 125 MTs., 12,75,120; Naresh Traders, 125 Ts., Rs. 12,75,120; From Japan: Pro-essive Trading Co., 36,000 Kgs., 4,75,032; The Supreme Ind. Ltd., 16 Ts., Rs. 2,20,492; From Saudi Arabia: astic Intl., 17.15 MTs., Rs. 2,19,350; avi Intl., 20,580 Kgs., Rs. 25,15,110; tyanarayan Plastic Inds., 24.75 MTs., . 2,74,848; Vishal Plast Enterprises, .5 MTs., Rs. 9,44,135; From Yugo-avia: Bharech Overseas Corpn., 36 Ts., Rs. 4,77,368; Ravi Intl., 63 MTs., s. 8,36,199.

LDPE: From FRG: Uniproducts ndia) Ltd., 2 MTs., Rs. 90,721; From atar: B.M. Thakkar & Co. Ltd., 165 Ts., Rs. 20,28,140; Bharat Flexo Pro-ucts, 16.5 MTs., Rs. 2,09,888; From udi Arabia: Leela Packaging Co. Ltd., .5 MTs., Rs. 6,12,638; Saras Poly-ck P. Ltd., 16.5 MTs., Rs. 1,73,441.

LLDPE: From Saudi Arabia: Eco-ast P. Ltd., 16.5 MTs., Rs. 1,73,441; bro Plast Corpn., 99 MTs., . 10,07,076; Gupta Plastic Udyog, .5 MTs., Rs. 18,463; Hemant Plastics Chemicals, 33,000 Kgs., . 3,44,084; Indexim P. Ltd., 33 MTs., . 3,44,084; Jain Irrigation Sys. Ltd., .5 MTs., Rs. 5,16,127; Vinav Plastics Ltd., 49.5 MTs., Rs. 5,11,930.

POLYPROPYLENE: From Brazil: shal Plastic Inds., NA., Rs. 2,60,112; om Czechoslovakia: Fibro Plast rpn., 84 MTs., Rs. 8,06,100; Mehta aders, 30 MTs., Rs. 2,87,894; From ly: Plasto Trades, 1,500 Kgs., . 2,64,485; From USA: Narendra lyplast, 17 MTs., Rs. 2,10,400; From goslavia: Calcutta Inds. Corpn., 50 Kgs., Rs. 5,93,753.

POLYSTYRENE: From Korea: ata Plastics Corpn., 34 MTs., Rs. 5,15,186.

PVC RESIN: From Argentina: More Water Pipes Ltd., 200 MTs., Rs. 35,62,076; From Brazil: Bhagirath Agro Plast P. Ltd., 50 MTs., Rs. 6,98,100; Hindustan Lubricant, 50 MTs., Rs. 6,98,100; Kisan Plastics, 30 MTs., Rs. 4,18,860; Movilex Plastics Ltd., 50 MTs., Rs. 6,99,731; From FRG: Lucky Plast Pvt. Ltd., 30 MTs., Rs. 6,58,266; From Korea: Jain Brothers Inds., 200 MTs., Rs. 25,52,323; The Supreme Inds. Ltd., 10 MTs., Rs. 13,60,623; From Mexico: Bhor Inds. Ltd., 2 MTs., Rs. 3,924; Crystal Containers, 51 MTs., Rs. 6,92,013; Hindustan Lubricants, 50 MTs., Rs. 6,21,882; From Romania: Ashish Inds., 100 MTs., Rs. 12,93,246; From Taiwan: Lily Chemicals P. Ltd., 52.5 MTs., Rs. 9,87,581.

MATERIALS IMPORTED BOMBAY (From 16.11.89 to 23.11.89)

ACRYLAMIDE: From Japan: J.M. Chemicals Inds., 7,500 Kgs., Rs. 1,90,734; Kohinoor Water Proof Works, 5,000 Kgs., Rs. 1,27,157; Swan Products, 700 Kgs., Rs. 1,78,020.

ALUMINIUM OXIDE: From USA: Grindwell Norton Ltd., 29,940 Kgs., Rs. 1,96,380; Tony Electronics Ltd., 200 Kgs., Rs. 2,78,048.

AROMATIC CHEMICALS: From Switzerland: Hindustan Lever Ltd., 1,450 Kgs., Rs. 3,53,853.

BROMINE LIQUID: From Israel: Chemical & Allied Products, 6,804 Kgs., Rs. 1,85,724; From Netherlands: Jaysynth Dyechem Ltd., 11,340 Kgs., Rs. 3,17,229.

4 B ACID TECH.: From UK: PDI Chemicals Ltd., 2,935 Kgs., Rs. 16,567.

CALCIUM CITRATE: From Ireland: G. Amphray Labs., 30,400 Kgs., Rs. 3,47,221.

CETYL PALMITATE: From FRG: Proctor & Gamble India Ltd., 200 Kgs., Rs. 11,367.

PARA CHLORO TOLUENE: From Japan: Benzo Chem Inds. P. Ltd., 1,500 Kgs., Rs. 4,42,230; Gujarat Insecticides Ltd., 1,500 Kgs., Rs. 44,223.

2-CYANOPYRAZINE: From Japan: Indo Pharma Pharm., 400 Kgs., Rs. 23,530.

CYCLOHEXANONE: From FRG: Letape India P. Ltd., 1,482 Kgs., Rs. 3,22,943.

DICARBOXYLIC ACID: From France: BASF India Ltd., 1,500 Kgs., Rs. 2,33,967.

DIETHYL CARBOMOYL CHLORIDE: From FRG: Chemipharm Chemical & Pharm., 1,900 Kgs., Rs. 1,53,782.

DIETHYL SULPHATE: From Japan: Ahmedabad Chemicals P. Ltd., 15,640 Kgs., Rs. 3,32,186; Henkel Chemicals India Ltd., 1,840 Kgs., Rs. 46,534.

DIETHYLENE GLYCOL: From Taiwan: Ganalax Trading & Finance P. Ltd., 36 MTs., Rs. 3,71,702.

5-5-DIMETHYL HYDANTOIN: From Japan: Infar India Ltd., 37.7 Kgs., Rs. 39,943.

2,5-DIMETHOXY 4-CHLORO ANILINE: From Japan: IDI Ltd., 5,000 Kgs., Rs. 1,33,179.

2,4-DINITRO 6-SEC-BUTYL PHENOL: From France: Synthetics & Chemicals Ltd., 500 Kgs., Rs. 36,476.

ETHYL FORMATE: From FRG: Cipla Ltd., 1,440 Kgs., Rs. 6,66,000.

FORMIC ACID: From FRG: Pacific Exports, 20,160 Kgs., Rs. 2,86,889.

FURAZOLIDONE BP: From Japan: V. Tribhovandas, 9 Kgs., Rs. 1,25,121.

8 HYDROXY QUINOLINE: From France: Eskay Fine Chemicals, 1,500 Kgs., Rs. 3,15,254.

IODINE CRUDE MIN. 99.5%: From Japan: Lub Chem, 2,000 Kgs., Rs. 6,30,694.

ISOPHORONE: From Japan: Coates of India Ltd., 1,425 Kgs., Rs. 3,06,828.

LINALOOL: From Japan: Hindustan Lever Ltd., 4,760 Kgs., Rs. 5,82,040.

MAGNESIUM OXIDE: From Japan: Geoffrey Manners & Co. Ltd., 300 Kgs., Rs. 1,60,725.

METHYL PARATHION TECH.: From GDR: Devidayal P. Ltd., 31.2 MTs., Rs. 2,57,360.

METHYLENE BIS THIOCYANATE: From UK: Ion Exchange India Ltd., 500 MTs., Rs. 83,833.

MONOETHYLENE GLYCOL: From USA: Reliance Inds. Ltd., 1,498.48 MTs., Rs. 22,40,522.

MONO METHYL ACETO ACETAMIDE MIN. 70%: From FRG: Sudarshan Chemical Inds. Ltd., 15,960 Kgs., Rs. 4,73,529.

MONOSODIUM GLUTAMATE: From Korea: Alpha Trade Agency, 16 MTs., Rs. 3,66,209.

NEO PENTYL GLYCOL: From FRG: Refnol Oil Refineries Pvt. Ltd., 2,000 Kgs., Rs. 48,385.

NITROAMINO PHENOL: From Japan: IDI Ltd., 450 Kgs., Rs. 2,61,674.

PARA OCTYL PHENOL: From Japan: Atsuan Chemical Corpn., 2,000 Kgs., Rs. 49,930.

D(-) ALPHA PHENYL GLYCINE METHYL POTASSIUM DANE SALT: From Netherlands: Cepham Labs P. Ltd., NA., Rs. 3,75,858.

HYDROXY PHENYL GLYCINE METHYL POTASSIUM DANE SALT: From Netherlands: Gujarat Lyka Organics Ltd., NA., Rs. 3,46,667.

PIVALOYL CHLORIDE: From France: Armour Chemicals Pvt. Ltd., 10,080 Kgs., Rs. 6,62,034; From FRG: S & S Pharmaceuticals (I) P. Ltd., NA., Rs. 57,009.

POLYVINYL ALCOHOL: From Japan: G.P. Electronics Ltd., 5 MTs., Rs. 2,33,817; The Raipur Mf Ltd., 200 Kgs., Rs. 94,943; S Vinyl & Chemical Inds., 500 Rs. 37,393.

POTASSIUM CHLORIDE From Canada: IDI Ltd., 80 Rs. 2,77,370.

POTASSIUM HYDROXIDE Czechoslovakia: Arofines, 500 Rs. 65,458.

SODIUM FORMALDEH SULPHOXYLATE: From Czec vakia: Sun Export Corpn., 1,200 Rs. 18,135.

TITANIUM DIOXIDE: From Plasti Chemi & Inds., 200 Rs. 9,96,904; From China: Research Centre, 35 Rs. 9,07,894; Popular Chemica 10.5 MTs., Rs. 2,97,792; From S pore: Asian Paints India Ltd., Kgs., Rs. 31,12,781.

PARA TOLUIDINE SULPHO ACID: From Korea: PDI Chem Ltd., 3,000 Kgs., Rs. 1,95,820.

TRIMETHOXY BENZAL HYDE: From France: Pragati Pha ceuticals P. Ltd., 2,000 Rs. 7,96,845.

TRIMETHYL PHOSPHATE: USA: Sudarshan Chemical Inds. 16,574 Kgs., Rs. 6,59,270.

META XYLIDINE ORTHO S PHONIC ACID: From Japan: Fo kem India Corpn., 50 Kgs., Rs. 84

DRUG MATERIALS IMPORT BOMBAY
(From 16.11.89 to 23.11.89)

CALCIUM D PANTOTHENA From Japan: Pharmaceutic Co., Kgs., Rs. 1,14,864.

LACTIC ACID 88% BP/USP: I Spain: Grauer & Weil India Ltd., 2 Kgs., Rs. 72,003.

PROMETHAZINE HCl BP: I China: Western Chemicals, 200 I Rs. 98,334.

ROPYLENE GLYCOL USP: From A: Alpha Trade Agency, 17,200 s., Rs. 3,64,544.

PLASTIC MATERIALS IMPORTED BOMBAY
(From 16.11.89 to 23.11.89)

HDPE: From Belgium: Muftifilm astics Pvt. Ltd., 17.15 MTs., s. 2,23,888; From Czechoslovakia: ssociated Brothers, 125 MTs., s. 13,22,340; Fibro Plast Corporation, 2.5 MTs., Rs. 17,19,042; Kalpesh astics Inds., 100 MTs., Rs. 10,57,872; om Japan: Kanpur Plastipack Ltd., 50 Ts., Rs. 6,52,396; Narmada Extrusion t. Ltd., 50 MTs., Rs. 7,17,753; Prad- n Laminators Ltd., 3,000 Kgs., 4,01,190; Shankar Packagings Ltd., 01 MTs., Rs. 12,74,309; From Neth- rlands: Moona Plastics Inds., 1,750 gs., Rs. 2,37,358; From Saudi Arabia: mar Plastics, 99.66 MTs., s. 13,51,161; Indore Plastics Pvt. Ltd., 1.45 MTs., Rs. 6,23,688; Injecto Plast nds. Pvt. Ltd., 343 MTs., Rs. 41,370; ai Real Estate, 51.45 MTs., s. 6,67,302; Shroff Plastics, 17.15 Ts., Rs. 2,09,349; The Supreme Inds. td., 33 MTs., Rs. 3,30,097; VIP Inds. td., 240.10 MTs., Rs. 27,68,065; From ngapore: Bright Packaging Pvt. Ltd., 7 MTs., Rs. 2,27,304; From USA: ssociated Plastics Inds., 14.399 MTs., s. 1,57,578; From Yugoslavia: Abhi- ek Corporation, 63 MTs., s. 8,15,251; Ravi International, 72 Ts., Rs. 9,56,656; Supra Plast, 50 Ts., Rs. 6,37,680.

LDPE: From Finland: Sterlite Inds ndia) Ltd., 64 MTs., Rs. 1,46,189; om Qatar: Bajaj Plastics Ltd., 99 Ts., Rs. 1,26,888; Grace Plastics, 16.5 Ts., Rs. 2,09,807; Jai Fibres Ltd., 33 Ts., Rs. 4,19,615; Raj Packaging ds. Pvt. Ltd., 31 MTs., Rs. 4,19,616; & S Filled Fibres Ltd., 16.5 MTs., s. 2,09,805; Super Pack, 50 MTs., s. 6,18,441; From Saudi Arabia: ultilayer, 16.5 MTs., Rs. 17,435; om Sweden: Universal Cables Ltd., 0 MTs., Rs. 6,20,252; From USA: Rollatahers Ltd., 33 MTs., Rs. 4,49,473; Shankar Packaging Ltd., 17 MTs., Rs. 2,14,596.

LLDPE: From Netherlands: K.K. Holdings & Finance Co. Pvt. Ltd., 150 MTs., Rs. 2,08,536; From Saudi Arabia: Fibro Plast Corpn., 82.5 MTs., Rs. 8,39,230; Daniel Phillips & Co. Pvt. Ltd., 97 MTs., Rs. 10,23,858; Gupta Plastic Udyog, 16.5 MTs., Rs. 1,70,643; King Plastics, 31 MTs., Rs. 3,36,194; M.R. Polyfilms Pvt. Ltd., 49.5 MTs., Rs. 51,193; Multifilms Plastics Pvt. Ltd., 1,650 Kgs., Rs. 1,72,231; Pan Asia International Pvt. Ltd., 115.5 MTs., Rs. 11,94,501; Sofeene Plastics, 16.5 MTs., Rs. 1,73,440; VIP Inds. Ltd., 33 MTs., Rs. 3,41,286; Vishal Plastics, 16.5 MTs., Rs. 1,68,098; From UAE: Perfect Colourants & Plastics Pvt. Ltd., 16.5 MTs., Rs. 1,76,365.

POLYPROPYLENE: From Austria: Diamond Polyplast Pvt. Ltd., NA., Rs. 3,89,570; From Belgium: Cosmo Films Ltd., 1,500 Kgs., Rs. 2,92,459; Milton Polyplast (I) Pvt. Ltd., 15 MTs., Rs. 1,78,019; From Brazil: Vishal Plastic Inds., 10 MTs., Rs. 1,30,056; From Czechoslovakia: Associated Brothers, 60.3 MTs., Rs. 5,38,666; Naresh Traders, 84 MTs., Rs. 8,06,100; Progressive Trading Co., 29.8 MTs., Rs. 2,85,974; From Hungary: Sunil Plastics Inds., 28,500 Kgs., Rs. 4,04,586; From Japan: Bisleri Beverages Pvt. Ltd., 2.46 MTs., Rs. 1,62,165; From Singapore: Gujarat Propack Ltd., 3,200 Kgs., Rs. 4,61,152; From USA: Garware Wall Ropes Ltd., 2,640 Kgs., Rs. 31,33,125; From Yugoslavia: Hindustan Ciba Geigy Ltd., 15.5 MTs., Rs. 2,19,799.

POLYSTYRENE: From Austria: Rinins Plast Pvt. Ltd., 1,500 Kgs., Rs. 2,91,465; From Korea: Ellora Electronics, 1,000 Kgs., Rs. 1,52,819; From Korea: Thermopack Inds., 12 MTs., Rs. 3,16,835.

POLYSTYRENE EXPANDABLE: From Korea: Thermopack Inds., 12 MTs., Rs. 2,96,096.

PVC RESIN: From Argentina: Grover Overseas Pvt. Ltd., 450 MTs., Rs. 54,11,196; Swastik Tubes Pvt. Ltd., NA., Rs. 6,31,542; Vinyl Tubes Pvt. Ltd., 50 MTs., Rs. 6,31,542; From Brazil: More Water Pipes Ltd., 20 MTs., Rs. 28,99,328; From Brazil: Moniles Plastics Ltd., 5 MTs., Rs. 6,99,731; From Korea: Oswal Cable Products, 25 MTs., Rs. 3,45,310; From Mexico: Amrit Chem, 33.3 MTs., Rs. 4,31,600; Chetna Polycoats Private Limited, NA., Rs. 12,71,740; Evermore Pipes Systems Private Limited, 1,665 Kgs., Rs. 2,17,135; Movilex Plastics Limited, 99 MTs., Rs. 13,06,012; Rigidor Plastics Private Limited, 102.434 MTs., Rs. 12,41,653; Shikha Polymers Private Limited, 4,995 Kgs., Rs. 6,37,892; Star Oxides & Chem. Limited, 49.9 MTs., Rs. 6,38,852; From Romania: Seval Ayat Niryat Company Private Limited, 125 MTs., Rs. 16,20,595; From Taiwan: J.K. Rexine Ltd., 105 MTs., Rs. 2,69,358; Kalpak Pipes Private Limited, 170 MTs., Rs. 21,76,062.

STYRENE MONOMER: From Australia: Bayer (India) Ltd., 1,482 Kgs., Rs. 2,33,672.

MATERIALS IMPORTED BOMBAY (27.11.89)

AMINO ANISIC ACIDANILIDE: From Japan: Sudarshan Chemical Inds., 200 Kgs., Rs. 85,593.

AZO ISOBUTYRONITRILE: From Netherlands: Infar India Ltd., 120 Kgs., Rs. 75,825.

BORAX: From USA: Shiva Impex, 3 MTs., Rs. 20,345.

BUTYL GLYCOL: From USA: Pioneer Chem Tech. Corpn., 29,200 Kgs., Rs. 4,01,476.

PARA TERT. BUTYL PHENOL: From Korea: Resins & Plastics Ltd., 12,000 Kgs., Rs. 2,64,484.

CALCIUM D PANTOTHENATE IP/USP: From FRG: Merck Ind 1,000 Kgs., Rs. 2,50,074.

CAPROLACTAM: From B LML Fibres Ltd., 248.5 Rs. 75,41,458.

CARBON BLACK: From Varunsak Plastic Paints & Che 420 Kgs., Rs. 2,89,154.

CLOPIRIDOL: From Hungar pharma Inds. Pvt. Ltd., 500 Rs. 99,182.

CRYOLITE SYNTHETIC: FRG: Hind Enterprises, 500 Rs. 29,797.

CUMENE HYDROPERO From Italy: Polychem Ltd., 5 Rs. 1,61,064.

DICHLORO NAPHTHALE ONE: From Japan: Reine Che 500 Kgs., Rs. 82,027.

N,N-DIMETHYL ACETA From FRG: Ranbaxy Labs., 2,89 Rs. 67,850.

DIPHENYLAMINE: From Fairdeal Traders, 2,000 Rs. 61,034.

EPICHLOROHYDRIN: Japan: Sun Exports Corpn., Kgs., Rs. 4,24,314.

ETHOXY METHYLENE THYL MALONATE: From FR Merck India Ltd., 5,000 Rs. 10,68,111.

ETHYL CYANOACETATE: Japan: Jaysynth Dye Chem Ltd., Kgs., Rs. 4,39,852.

GAMMA FERRIC OXIDE: Japan: Straw Products Ltd., 9,000 Rs. 4,96,026.

1,6-HEXANE DIOL: From IDI Ltd., 1,000 Kgs., NA.

2-ISOPROPYL PHENYL METHYL CARBONATE: From Bayer India Ltd., 5,000 Rs. 29,79,585.

ISOPROPYL MYRISTATE: FRG: Sterling Orgo and Inorgo C

Ltd., 1,050 Kgs., Rs. 52,112.

LUTIDINE: From Japan: R. a & Co., 185 Kgs., Rs. 40,775.

NCOZEB TECH.: From Nether- Lupin Agro Chemicals P. Ltd.,) Kgs., Rs. 16,26,182.

ERCURY 99.99% PURE: From : The Standard Inds. Ltd., 100 Rs. 4,54,371.

RCHLORO ETHYLENE: From : Anshul Chemicals Pvt. Ltd., 50 Kgs., Rs. 1,66,981.

(-) ALPHA PHENYL GLYCINE ORIDE HCl: From Netherlands: an Chemical Co. Ltd., 2,030 Kgs., 7,51,715; Ranbaxy Labs Ltd., 75 Kgs., Rs. 43,00,163.

(-) PARAHYDROXY PHENYL YCINE DANE SALT: From Neth- nds: Armour Chemicals, 2,000 Kgs., 6,78,206.

OLYETHYLENE GLYCOL: From G: Fulford India Ltd., 5,060 Kgs., 1,35,015.

OLYVINYL ALCOHOL: From an: Garden Silk Mills Ltd., 3 MTs., 1,37,329.

ILICON METAL: From China: dustan Alloys Mfg. Co. Ltd., 40 s., Rs. 7,79,891; Omprakash Rakesh nar, 20 MTs., Rs. 3,43,150.

TITANIUM DIOXIDE: From China: ular Chemical Co., 7 MTs., 1,95,821; From USA: Asian Paints India Ltd., 56,000 Kgs., Rs. 24,30,546.

TRICHLOROETHYLENE: From Japan: Shah Chhaganlal Laxmichand, 16,500 Kgs., Rs. 1,54,959.

TRIMETHYLOL PROPANE: From Sweden: A.S. Corpn., 2,000 Kgs., Rs. 64,928.

PLASTIC MATERIALS IMPORTED BOMBAY (27.11.89)

HDPE: From Japan: Ecoplast Pvt. Ltd., 16.5 MTs., Rs. 1,25,014; From Saudi Arabia: Universal Lugg. Mfg. Co. Ltd., 411.6 MTs., Rs. 47,45,264.

LDPE: From FRG: The Swadeshi Mills Co. Ltd., 1,500 Kgs., Rs. 7,20,400; From Qatar: Iveon Labs, 16.5 MTs., Rs. 2,12,605; From UAE: Primo Pick n Pack Pvt. Ltd., 16.5 MTs., Rs. 2,12,605; Svar Plastics Pvt. Ltd., 1,650 Kgs., Rs. 2,09,808; From Netherlands: Futura Packaging I. Ltd., 15 MTs., Rs. 2,03,450.

LLDPE RESIN: From Canada: K.N. Holdings & Finance Co. Pvt. Ltd., 16 MTs., Rs. 2,14,300; From Netherlands: Essel Packaging Ltd., 15 MTs., Rs. 2,10,907.

POLYPROPYLENE: From Belgium: Chloride Inds. Ltd., 30 MTs., Rs. 5,21,342; From Brazil: Chevoit Co. Ltd., 50 MTs., Rs. 7,87,936; From France: Cosmo Films Ltd., 3,255 Kgs., Rs. 1,32,468; From Netherlands: Calcutta Indl. Corpn., 1,580 Kgs., Rs. 1,90,191; From Spain: Jay Corpn., 90 MTs., Rs. 10,45,224; From UK: Atul Enterprises, 31.7 MTs., Rs. 4,03,084; Dinshaw Iron Works, 15.85 MTs., Rs. 01,542; Jaisingh Packaging, 4,200 Kgs., Rs. 6,26,935; Presswell Inds., 31.7 MTs., Rs. 4,03,084; From USA: Jay Corpn., 1,54,925 Kgs., Rs. 16,46,823.

POLYSTYRENE: From Korea: Godrej & Boyce Mfg. Co. Ltd., 17 MTs., Rs. 2,89,072; Vimal Moulders Pvt. Ltd., 17 MTs., Rs. 2,59,398; Vinrepp Enterprises, 30 MTs., Rs. 4,75,798.

PVC RESIN: From FRG: Premier Vinyl Flooring Ltd., 60 MTs., Rs. 6,59,067; From Korea: Finolex Pipes Ltd., 1,000 MTs., Rs. 1,27,73,465; The Supreme Inds. Ltd., 500 MTs., Rs. 63,79,268; From Mexico: Cable Corpn. of India Ltd., 4,995 Kgs., Rs. 6,38,624; From Saudi Arabia: Ashish Chemo Plast Pvt. Ltd., 49.1 MTs., Rs. 1,27,883; Jef PVC Pipes Pvt. Ltd., 297 MTs., Rs. 35,24,767; From Spain: Sanghi Leathers Pvt. Ltd., 28 MTs., Rs. 5,47,888; From Yugoslavia: B VM Electrical Products, 3,000 Kgs., Rs. 5,61,771; Caprihans India Ltd., 25 MTs., Rs. 34,79,630; Combine Auto Ltd., 1,200 Kgs., Rs. 2,24,569; Mohanrams, NA., Rs. 1,79,916.

STYRENE MONOMER: From Australia: Aeropolymers Pvt. Ltd., 14.82 MTs., Rs. 2,36,185.

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COBALT SULPHATE
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